[COMMITTEE PRINT]

# SELECTED INFORMATION ON PROPOSED SNAKE RIVER RECLAMATION PROJECT

## INCLUDING HELLS CANYON DAM

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SUBMITTED BY

DEPARTMENT OF THE INTERIOR

IN RESPONSE TO THE REQUEST OF

HON. CLAIR ENGLE, CHAIRMAN

SUBCOMMITTEE ON IRRIGATION AND RECLAMATION

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DOCUMENTS EXPEDITING PROJECT

# SELECTED INFORMATION ON PROPOSED SNAKE RIVER RECLAMATION PROJECT, INCLUDING HELLS CANYON DAM

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Hon. JOHN R. MURDOCK,
*Chairman, Committee on Interior and Insular Affairs,*
*House of Representatives, Washington, D. C.*

DEAR MR. CHAIRMAN: During the hearings on H. R. 5743, a bill to authorize the initial phase of the Snake River project which includes the proposed Hells Canyon Dam, several requests were made by committee members for additional information, to be submitted by the Department of the Interior's representatives.

The Department has compiled this additional information and included it in four exhibits. The material requested by Congressman Bow will be submitted separately. The exhibits are as follows:

Exhibit A. A statement in response to inquiries of committee members Miller, Morris, Aspinall, and Saylor concerning four items (*a*) the importance of power in the development of irrigation in the West, (*b*) the adequacy of irrigation and power all through the West, (*c*) the relationship of Hells Canyon to the President's water policy, and (*d*) the relative values to irrigation and flood control from private dams as compared with Reclamation developments.

Exhibit B. A statement in response to the request of Chairman Engle giving a comparison of the proposed Federal Hells Canyon development with the proposed private power developments, and with other alternatives.

Exhibit C. A statement in response to the request of committee members, Mr. Saylor and Mr. Budge, giving a comparison of prime power capability and financial analysis as presented in volume 2 of House Document 473, and in the present testimony and reports on Hells Canyon, including a repayment study in tabular form for Hells Canyon and for Scriver Creek developments similar to that shown in House Document 473.

Exhibit D. A statement in response to the request of Chairman Engle, which is a reply to the testimony of Holland Houston, consulting engineer.

The above-mentioned information is of vital importance to the members of the committee who will consider this matter further in the next few weeks.

I, therefore, respectfully suggest that the material be made available to all concerned as an official committee print.

Sincerely,

CLAIR ENGLE,
*Chairman, Subcommittee on Irrigation and Reclamation.*

## EXHIBIT A

### IMPORTANCE OF POWER IN THE DEVELOPMENT OF IRRIGATION PROJECTS

The development of the West is due largely to the development of its water resources to supply water for irrigation and for generation of low-cost hydroelectric power. Even when full development of the water resources of the West

is attained, there will still be large areas of undeveloped land, for water is scarce. Thus, it is essential that full use be made of all water resources through multiple-purpose development wherever practicable, as only in this way can the full potentialities of the limited water resources of the West be realized.

From the very beginning of the Federal reclamation program, hydroelectric power has played an important part. The earlier power plants were constructed primarily to furnish power for project uses, such as for construction purposes or for irrigation pumping. An example of the former is the Pilot Butte plant of the Bureau of Reclamation on the Riverton project in Wyoming. After serving its primary purpose, it has been used to supply energy which has been sold for commercial purposes, primarily for the replacement of high cost fuel energy. Example of plants constructed primarily for project pumping are the Black Canyon plant on the Boise project in Idaho, and the Prosser plant on the Yakima project in Washington. In addition to supplying pumping power, some of the earlier power plants were built to supply power for domestic and commercial purposes, such as at the Minidoka Dam on the Snake River in Idaho. Revenues from the sale of power at such plants were directed by the Congress to be covered into the reclamation fund and placed to the credit of the project in the Town Site Act of 1906. Thus almost from the beginning of the Federal reclamation program there has been provision for the use of power revenues to assist in returning the costs of projects.

The first major multiple-purpose project which the Bureau of Reclamation constructed primarily as a power project was the Hoover Dam, authorized by the Boulder Canyon Project Act in December 1928, which contemplated the use of commercial power revenues to repay the cost of the dam, including the part of the cost that would normally have been charged to irrigation. Other major multiple-purpose dams, such as the Grand Coulee and Shasta Dams, will, in addition to supplying power for project pumping and for some private irrigation pumping, generate vast quantities of power for commercial sale, the revenues from which will be used to return a large portion of the costs of the irrigation works of the project. To give some idea of the magnitude of the repayments by power from some of these projects, on the Columbia Basin project, the power revenues from Grand Coulee Dam will repay about 72 percent of the costs allocated to irrigation, on the Central Valley project, power revenues will repay 73 percent of irrigation costs, on the Colorado Big Thompson project, power revenues will pay about two thirds of irrigation costs, and on the Missouri River Basin project, with current costs and expected revenues, the power installations will pay out about three fourths of the costs allocated to irrigation.

It can thus be seen that the importance of power in our reclamation program cannot be overestimated. Only through the construction of such projects as Hells Canyon Dam and the great Colorado River dams now under consideration, in continuation of the established partnership of hydroelectric power and irrigation, can the reclamation program authorized by the Congress in the Federal reclamation laws move forward. The Snake River project bill, H. R. 5743, would set up the procedures whereby the Congress can from time to time authorize projects in the Snake River Basin and permit them to share in the revenues from the sale of power from the Hells Canyon Dam in the same manner as do the projects referred to above. Each such project could be added only with specific approval by the Congress. Without such financial assistance from power revenues, it is doubtful whether any of the projects which are contemplated for the Snake River Basin could be built under the reclamation laws.

### OTHER DAMS WITHOUT IRRIGATION FEATURES

A number of other dams have been constructed by the Bureau of Reclamation, or are now under construction, solely for power, or with only incidental uses for other purposes, and no use for irrigation. Among these are the Davis Dam on the lower Colorado River and the Keswick Dam on the Sacramento River; the Eklutna project near Anchorage, Alaska, was authorized by the Congress for the single purpose of power generation. Most strikingly parallel to Hells Canyon is the Hungry Horse project, now under construction in western Montana, which was authorized by the Congress for power production and other beneficial uses, with provision that irrigation works could be added at a later date if found feasible by the Secretary of the Interior, much in the same manner that the Congress would, in passing H. R. 5743, reserve the right to add irrigation divisions to the Snake River project at a later date.

### ADEQUACY OF IRRIGATION AND POWER ALL THROUGH THE WEST

Each year the House Committee on Interior and Insular Affairs holds hearings of a general nature on the Reclamation program to bring out the need for irrigation and power in the West. Most recent of these hearings was on January 31, 1952, and has been published under the title, "A Report and Discussion of the Reclamation Program," Serial No. 8. In 1951, the hearings of February 12 and 14 were published as "General Study of Irrigation and Reclamation Problems," Serial No. 1, by the committee. At these hearings, particularly the latter, the Bureau of Reclamation and other witnesses brought out the needs of the West for irrigation and power to help sustain its rapidly increasing population and indicated the importance of western water resource development to the welfare of the whole Nation. As these hearings are available to the members of the committee, the information contained therein will not be repeated here, except to say that the primary need in the Pacific Northwest and in other portions of the West at this time is for low cost hydroelectric power for industry which is stimulated by the Nation's defense needs. As the West continues to grow, more irrigated land will be needed to sustain the increased population. Hydroelectric power and irrigation must continue to be developed together to meet these needs.

### RELATIONSHIP OF HELLS CANYON TO THE PRESIDENT'S WATER POLICY

The President's views on this project and its relationship to his water resources program are set out in Budget Director Lawton's letter of August 15, 1951, which is printed on page — of these hearings. The President's 1953 budget message, transmitted to the Congress on January 21, 1952, included provision for funds to initiate the Hells Canyon project as soon as it is authorized. The water resources portion of the message contained the following statement:

"Only a limited number of new starts for these [land and water resources] programs are recommended in this budget. They are restricted to urgently needed power projects in critical shortage areas, flood-control projects in the Kansas-Missouri area, and emergency rehabilitation work which cannot be deferred.

"* * * In order to further expand our power potential, four new river development projects are recommended for initiation in fiscal year 1953. These are the St. Lawrence project, Hells Canyon power project and Ice Harbor lock and dam on the Snake River, and the Hartwell Reservoir in South Carolina.

"The Ice Harbor and Hartwell projects are authorized, but the St. Lawrence development and Hells Canyon power project require authorization by the Congress. I again urge the Congress to authorize these two projects without delay. The $37 million recommended for the four projects would permit the starting of construction on these important developments."

The President's 1953 budget included the following under the heading "proposed for later transmission:"

"Construction and rehabilitation, Bureau of Reclamation (under proposed legislation, 1953): It is proposed to initiate construction of the Hells Canyon project, Idaho-Oregon, in fiscal year 1953 when authorized. This project is required to aid in relieving the power shortage in the Pacific Northwest. An amount of $8,000,000, is included in the budget as an estimated 1953 supplemental appropriation."

The President's Water Resources Policy Commission in its report to the President of December 11, 1950, recommended that:

"Full development of the Nation's undeveloped water power resources, as an integral part of comprehensive basin programs, should be considered a major Federal responsibility, to be exercised in such a way as to assure ample supplies of hydroelectric energy well in advance of expanding regional and national needs."

With reference to the Columbia River Basin, the President's Commission stated that:

"In a larger sense the successful completion of the Columbia Basin program depends upon enlightened statesmanship on the part of Congress in setting the guide lines for future action and in regulating the speed of undertaking the separate parts. Unless discerning and firm guidance is given in those respects, the great program of works which ultimately will stand in concrete, in ditches, in vegetated slopes, in power transmission towers across the basin, will fall short of contributing in the right degree and at the right time to the national welfare."

Specifically, the Commission states:

"Major dams such as the Chief Joseph, Albeni Falls, Hungry Horse, and Hells Canyon projects should be completed as soon as practicable."

RELATIVE VALUES TO IRRIGATION AND FLOOD CONTROL FROM PRIVATE POWER INSTALLATIONS AS COMPARED WITH RECLAMATION DEVELOPMENTS

The values of multiple-purpose reclamation developments to irrigation and to flood control greatly exceed those obtainable through private power developments. Values to these purposes of any power development depend upon (1) the amount and cost of power provided which may be needed for irrigation pumping purposes, (2) the financial assistance in the return of irrigation construction costs which can be made available from power revenues, and (3) the amount of storage space which can be provided for flood-control purposes. Normally, private power developments can contribute only in the first respect, and then less effectively than reclamation power developments, whereas multiple-purpose reclamation developments contribute to all three.

Private power developments have done much throughout the West, including the Snake River Basin of Idaho, in providing a source of power for irrigation pumping. The cost of power from private developments, however, is too high in some instances to meet irrigation needs. Power at rates lower than those available from private developments will be requisite for the higher lifts of many future developments, including several in the Snake River Basin. To cite an existing example in another part of the Columbia River Basin, without the low rates available from the power plants at Grand Coulee Dam, it would not be possible to lift water 280 feet from the reservoir to serve the million-acre Columbia Basin project.

As regards financial assistance in the return of irrigation costs which are beyond the ability of water users to repay, there is none when private power installations are made, in contrast to the assistance of up to 75 percent of irrigation costs cited in the first part of this statement. The need for this type of assistance for future projects in the Snake River Basin is portrayed in the statement of Regional Counsel Howard R. Stinson of the Bureau of Reclamation, prepared for these hearings. It appears that none of the future projects in the Snake River Basin will be possible under the Federal reclamation laws, unless they have power installations in connection with the irrigation.

Private power developments customarily have little, if any, flood-control value as compared with publicly developed projects, as they do not have sufficient storage capacity. The run-of-river plants with which Hells Canyon is being compared would have no flood-control benefits, as they would contain insufficient volume of storage to hold more than a small portion of any major flood. It is even possible that some of these small earth and rock fill dams might create a flood hazard should a major flood strike, which would overtop them as the private power companies do not customarily design their structures with as high safety factor as do the Federal agencies.

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EXHIBIT B

COMPARISONS—HELLS CANYON WITH OXBOW AND VARIOUS PLANS FOR ULTIMATE DEVELOPMENT

Any proposal which is to be considered seriously must be appraised not only in its own light, but also in terms of how well it fits into and becomes a useful part of the best development for ultimate full use of the Snake River resources.

The following comparisons permit such an appraisal of the Hells Canyon (Federal) and Oxbow (Idaho Power Co.) Dams, which are the only tangible proposals for development of this section of the Snake River which are now before the public.

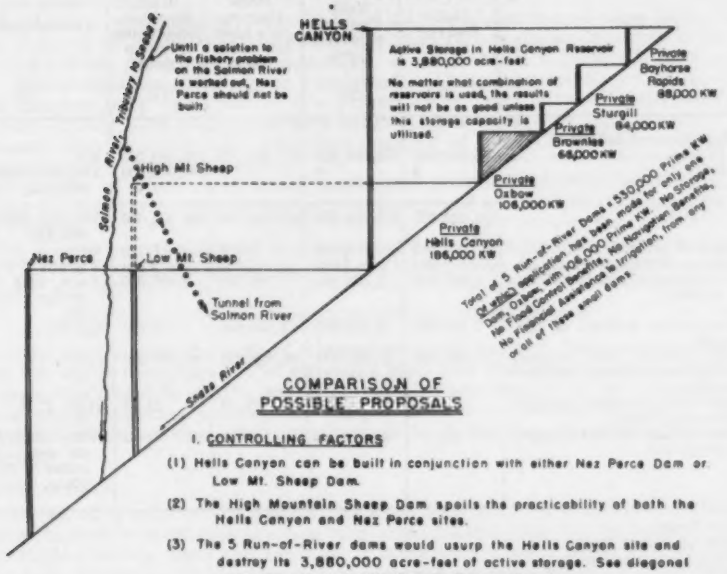
The comparisons also show how each of these proposals relate to the ultimate possible development.

The comparisons also permit the distractions of alleged "alternate proposals" which have been suggested, to be seen for what they are—simply poorer ways of utilizing the Snake River.

To this end, two tables and a diagrammatic sketch are made a part of this exhibit. The summary table No. 1 and its detailed counterpart, No. 2, with explanatory notes, show data related to each of the proposals. In fact, it shows many more comparisons than are attempted to be covered in this brief statement, but the primary purpose is to make basic comparisons that will identify clearly the best over-all plan, and the elements which compose it.

The sketch will be most useful for this purpose, for it permits a visual understanding of each of the combinations of dams that is possible in the development of the middle Snake River water resources.

## DIAGRAMATIC SKETCH


HELLS CANYON
Until a solution to the fishery problem on the Salmon River is worked out, Nez Perce should not be built.
Salmon River, Tributary to Snake R.
High Mt. Sheep
Nez Perce
Low Mt. Sheep
Tunnel from Salmon River
Snake River
Active Storage in Hells Canyon Reservoir is 3,880,000 acre-feet
No matter what combination of reservoirs is used, the results will not be as good unless this storage capacity is utilized.
Private Bayhorse Rapids 88,000 KW
Private Sturgill 84,000 KW
Private Brownlee 64,000 KW
Private Oxbow 106,000 KW
Private Hells Canyon 196,000 KW
Total of 5 Run-of-River Dams = 530,000 Prime KW
Of which application has been made for only one Dam, Oxbow, with 106,000 Prime KW. No Storage, No Flood Control Benefits, No Navigation Benefits, No Financial Assurance is Irrigation, from any or all of these small dams

## COMPARISON OF POSSIBLE PROPOSALS

### 1. CONTROLLING FACTORS

(1) Hells Canyon can be built in conjunction with either Nez Perce Dam or Low Mt. Sheep Dam.

(2) The High Mountain Sheep Dam spoils the practicability of both the Hells Canyon and Nez Perce sites.

(3) The 5 Run-of-River dams would usurp the Hells Canyon site and destroy its 3,880,000 acre-feet of active storage. See diagonal note, one note in Hells Canyon Reservoir area.

### 2. PRIORITY OF PLANS

| | | Loss of Potential | | | Cost of |
|---|---|---|---|---|---|
| | | Power KW Capability | Storage Acre Ft. | Flood Control & Other Benefits | Power per KW-Year |
| (1) | Best ultimate plan — Hells Canyon plus Nez Perce | 0 | 0 | 0 | $16.38 |
| (2) | 2nd best plan — Hells Canyon plus Low Mountain Sheep | 300,000 | 2,600,000 | $7,800,000 | $17.13 |
| (3) | 3rd plan — High Mt. Sheep plus 4 Run-of-River Dams | 600,000 | 3,700,000 | $8,800,000 | $24.37 |

### 3. CONTRIBUTIONS OF:

| | | Added Potential | | | At Cost |
|---|---|---|---|---|---|
| | | Power KW Capability | Storage Acre Ft. | Flood Control & Other Benefits | of Power per KW-Year |
| (1) | Hells Canyon alone | 1,100,000 | 3,900,000 | $43,500,000 | $15.62 |
| (2) | 5 Run-of-River Dams alone | 500,000 max. | None | None | $19.97 min. $33.85 max. See tables for details |

### 4. CONCLUSIONS: That

(1) Hells Canyon is an essential part of both of the two best plans.

(2) Any one, or all of the Run-of-River dams make full resource development impossible, and at best, result in the loss of 600,000 KW of prime power and 3,700,000 Acre-feet of Storage.

(3) No combination of down-stream storage with the Run-of-River dams is as effective as either combination that utilizes the Hells Canyon site. In short, if Hells Canyon storage capacity is wasted by construction of small dams, that loss will be permanent and cannot be recovered by any other combination of dams.

(4) Hells Canyon requires less capital investment than any other proposal, or combination of proposals that will produce equivalent results (see Table No. I).

(5) The power from Hells Canyon Dam is urgently needed, and that dam can be completed more quickly than any other of the large dams, such as the High Mountain Sheep or Nez Perce Dams.

(6) Hells Canyon is Therefore the most effective and best next development.

TABLE NO. 1.—*Summary of comparisons*

| Item | Hells Canyon alone (1) | Hells Canyon plus Nez Perce (2) | Hells Canyon plus Low Mountain Sheep (3) | High Mountain Sheep plus 4 run-of-river (4) | 5 run-of-river alone (5) |
|---|---|---|---|---|---|
| Cost, millions of dollars: | | | | | |
| Federal | 356,000,000 | 976,000,000 | 917,000,000 | 505,000,000 | 0; 0. |
| Private | 0 | 0 | 0 | 219,000,000 | 300,000,000; 134,000,000. |
| Total | 356,000,000 | 976,000,000 | 917,000,000 | 724,000,000 | 300,000,000; 134,000,000. |
| Total head utilized, feet | 602 | 1,182 | 1,127 | 1,125 | 600. |
| Hydraulic heights, feet | 602 | [1] 615 | [2] 560 | [3] 739 | Various 75 to 210. |
| Active storage available, millions of acre-feet. | 3,900,000 | 8,700,000 | 6,100,000 | 5,000,000 | None, and destroys storage opportunity. |
| Prime power, millions of kilowatts. | 1,100,000 | 2,500,000 | 2,200,000 | 1,900,000 | 500,000. |
| Other benefits, flood control, navigation, recreation, millions of dollars. | 43,500,000 | 57,400,000 | 49,600,000 | 48,600,000 | None. |
| Annual cost of power, per kilowatt-year, dollars. | 15.62 | 16.38 | 17.13 | 24.37 | 24.91; 27.14. |
| Priority of plans for full resource development. | [4] | 1 | 2 | 3 | Run-of-river dams are not a part of either of the 2 best plans. |

[1] Nez Perce.
[2] Low Mountain Sheep.
[3] High Mountain Sheep.
[4] Hells Canyon is essential part of both best plans.

NOTES.—See table No. 2, "Detail of comparisons," for explanatory notes. For simplicity in this table, figures have been rounded-off, viz, Hells Canyon would add 1,124,000 kilowatt prime power. Table shows 1,100,000 kilowatts.

### COMPARISON—HELLS CANYON AND OXBOW

The first basic comparison is between the only specific proposals that are currently before the public for consideration, namely, Hells Canyon and Oxbow.

The Idaho Power Co. has applied to the Federal Power Commission for a preliminary permit to construct a small dam at the Oxbow site. That site is located within the reservoir area of the major Hells Canyon project. As may be seen from the graph, either Hells Canyon, or Oxbow can be built, but not both. The basic question, of course, is, which?

A Federal Power Commission permit, in effect, is nothing more than an option. There is absolutely no obligation attached to the permit that would require the power company to build Oxbow, even if the permit were granted. The permit is merely a reservation for a stipulated period of time. For the purpose of this comparison, however, it must be assumed that if the permit were granted, the power company would build Oxbow. On the assumption that the power company would actually build Oxbow, the comparison is simple.

The small Oxbow Dam, purely for power, would develop 106,000-kilowatts prime power capability, less than one-tenth of the 1,124,000-kilowatt prime power capability of Hells Canyon. Oxbow would provide no (zero) active storage capacity for flood control or navigation benefits downstream, as compared to 3,880,000 acre-feet of active storage capacity which would be provided by Hells Canyon.

### COMPARISON—HELLS CANYON AND ALL FIVE RUN-OF-RIVER DAMS

The witnesses in behalf of the power company position, and the power company officials in Idaho have talked about five run-of-river plan of low dams in the Hells Canyon Reservoir site. The company has not applied for a Federal Power Commission permit for any of the other four dams, and under these circumstances has not indicated its immediate, or even its ultimate intention to put those dams under construction. For this comparison, however, we must presume again, as was done for Oxbow, that the company would actually build those dams.

Assuming, therefore, both good faith, and a genuine intent to construct all five of the five run-of-river dams, it is possible to make further comparisons.

The five run-of-river dams would occupy, physically, the same section of the river as Hells Canyon Reservoir, but they would not utilize it in the same manner, or to the same degree.

Even if the power company were to build all five of the run-of-river dams, they would develop only 390,000 kilowatts of prime power on an isolated basis, or 530,000-kilowatt prime power capability, if they were integrated into other utility power systems, and power purchased. Thus, on an isolated basis, they would develop only one-third of the prime power capability of Hells Canyon. And even if they were integrated with some other system and firming power was purchased, they would develop less than one-half of the 1,124,000-kilowatt prime power capability of Hells Canyon.

And all five of those small dams would still produce no (zero) active storage capacity for flood control and navigation, compared to the 3,880,000 acre-feet in Hells Canyon.

What is even more important is the usurpation and permanent loss of that great Hells Canyon site if any one, or all, of those run-of-river dams is built.

COMPARISONS—POSSIBLE COMBINATIONS OF DAMS

As may be seen on the sketch, various combinations of dams are possible to utilize the water resources. The objective is to find that combination which will best meet the ultimate needs, and will most nearly result in full development the resources. Having ascertained that, it is easy to identify its parts. Only those dams which are elements in the best ultimate development should be undertaken now.

*Controlling factors*

Even casual study of the sketch discloses that there are certain controlling physical factors in arranging the combinations of dams that can be built.

(1) Hells Canyon Dam can be built in conjunction with either the Nez Perce or the Low Mountain Sheep Dams, but not with any of the run-of-river dams.

(2) The High Mountain Sheep Dam spoils the practicability of both the Hells Canyon and Nez Perce sites.

(3) The five run-of-river dams would usurp the Hells Canyon Reservoir site, and permanently destroy the potential of its 3,880,000 acre-feet of active storage capacity.

(4) Four run-of-river dams can be built in conjunction with the High Mountain Sheep Dam.

Recognizing these physical relationships, comparison is made of the three best ultimate plans. For simplicity, references to the table are to summary table No. 1, but the same results will be obtained by the use of either table.

*Hells Canyon plus Nez Perce*

The sketch indicates clearly that the construction of Hells Canyon and Nez Perce develops most fully the potential water resources since all available head, all available storage, and all available stream flows are fully utilized. Together they would develop 8.7 million acre-feet of storage, and produce 2.5 million kilowatts of prime power capability as shown in the table. The table also reveals that no other combination of dams will produce as much storage, or as much power, or as much flood control, navigation, and other benefits as Hells Canyon plus Nez Perce. With equal clarity, it reveals that the annual cost of power per kilowatt-year is the cheapest of any full resource plan. The Hells Canyon plus Nez Perce combination is therefore the best plan for full resource development.

Since Nez Perce would effectively block off the salmon run from the lower Snake River to the Salmon River, Nez Perce should not be built at this time, or until a solution to the salmon situation is found. The Hells Canyon Dam portion of this plan can proceed, however. Hells Canyon is an essential part of this best plan. Also, Hells Canyon avoids the Salmon River fish problem.

Since the Hells Canyon plus Nez Perce plan is the best, all comparisons of other plans are made to it.

*Hells Canyon plus Low Mountain Sheep*

This is the second best of the plans. It would develop 6.1 million acre-feet of storage and 2.2 million kilowatts of prime power capability, and develops the second largest amount of flood control and other benefits.

The Low Mountain Sheep Dam is, in effect, the upper portion of the same reservoir that would be created by Nez Perce. The Low Mountain Sheep Dam would be built above the mouth of the Salmon River and therefore avoids most of the salmon fishery problem, and can receive flows diverted by gravity through a tunnel from the Salmon River, to supplement natural Snake River flows.

Comparison of this plan with the best plan (Hells Canyon plus Nez Perce) indicates that this combination would produce 300,000 less kilowatts of prime power capability, and 2,600,000 acre-feet less storage capacity, $7.8 million less flood control and other benefits with a 5 percent increase in annual cost of power per kilowatt-year.

Hells Canyon is also an essential element of this next best plan.

*High Mountain Sheep plus four run-of-river dams*

The sketch discloses also that it is possible to build a High Mountain Sheep Dam at approximately the same site as the Low Mountain Sheep Dam, and in addition, build the upper four of the five run-of-river dams. To improve the feasibility of this combination, studies have also been made of the possibility of diverting a portion of the flows of the Salmon River through a tunnel into the reservoir above the High Mountain Sheep Dam, thus augmenting power production at that dam. This is the third best plan.

This plan would develop 5 million acre-feet of storage capacity and 1.9 million kilowatts prime power capability. Compared to the best plan, it also represents a loss of potential of 600,000 kilowatts prime power capability, a loss of 3.7 million acre-feet of storage capacity, and a loss of $8.8 million of flood control and other benefits.

Further, it would cost the United States an initial outlay of approximately 150 million more dollars than Hells Canyon, and would require an expenditure of hundreds of millions of dollars by the private power company.

This High Mountain Sheep plus four run-of-river dams plan has been the subject of recent investigations by the Corps of Engineers in a report prepared by the district engineer on March 14, 1952, and concurred in by the Division engineer on March 18, 1952. That confirms the fact that the plan which includes Hells Canyon as a part of the basic development, is the best and most economical method. The district engineer states in his recommendation: "It is the opinion of the district engineer that the findings of this report do not support any major revisions at the present time in the plan for development of the middle Snake and Salmon Rivers previously recommended in the report under review." The Hells Canyon Dam was recommended in the previous report, and the current recommendation therefore continues and reaffirms the approval of that previous recommendation.

If the High Mountain Sheep Dam is built, neither the Nez Perce nor the Hells Canyon Dams could be built or justified, and the loss of storage capacity in the Hells Canyon site would be a permanent loss, and nothing could ever be done to recover it.

Incidentally, it is noteworthy that the High Mountain Sheep Dam, with a hydraulic height of 739 feet, would be a dam of completely unprecedented height. by way of comparison, Hoover (Boulder) Dam has a hydraulic height of 576 feet. It would take years to make the detailed plans for such a structure, and many more years to build it.

Thus, this third best plan, which includes run-of-river plants, does not compare with either of the best plans.

## ESSENTIAL ELEMENTS IN BEST PLANS FOR FULL RESOURCE DEVELOPMENT

Hells Canyon is an essential element in both of the two best plans for ultimate development.

No one, or all, or any combination of the run-of-river dams is included in either of the two best plans for ultimate development.

Brief tabulations are provided on the sketch showing the best plans, and comparing the merits of Hells Canyon versus the run-of-river plants as parts of any ultimate plan. This is done to make the sketch a brief, self-contained, yet reasonably comprehensive exhibit.

## OTHER PROPOSALS

*Kooskia Dam*

One of the witnesses, Mr. Holland Houston, described in his own terms, a plan to develop Kooskia Dam on another river. There is no engineering report on any such dam as the one he described. Subsequent checking with the Corps of Engineers has disclosed that in certain of his statements his implications were erroneous.

The Kooskia Dam which was investigated by the Corps of Engineers was an entirely different structure, one that would produce only a fraction of the storage and a fraction of the prime power capability ascribed to it by Mr. Houston.

The Kooskia Dam recommended by the Corps of Engineers would produce, according to the Corps of Engineers figures, a total of about half a million kilowatts of prime power capability taking into account both the power to be developed at Kooskia Dam itself, and the power which could be developed at other downstream plants as a result of storage in Kooskia. The Kooskia Dam recommended by the Corps of Engineers as a part of the ultimate plan for this other river has been studied and there are engineering reports on it. Hence, though the name is the same, the Kooskia Dam referred to by Mr. Houston is something else, something else, something as yet undefined in the absence of engineering and economic reports concerning it.

It is irrelevant in any event, for the question is not one of how best to develop other dams on other rivers. The question is, what is the best development of the Snake—that is, shall the Hells Canyon Reservoir site be utilized fully, or shall it be usurped for smaller dams with less power and no storage?

This Kooskia suggestion is brought into this comparison only to show its irrelevancy, and to identify it as an influence which has the tendency of diverting attention from the valid comparisons that could and should be made.

## SUMMARY

*Priority of plans*

The best plan: Hells Canyon plus Nez Perce.
Nest best plan: Hells Canyon plus Low Mountain Sheep.
Third plan: High Mountain Sheep plus 4 run-of-river dams.

*Conclusions and observations*

(1) It should be noted that Hells Canyon is an essential part of each of the two best plans. No plan that does not include Hells Canyon can be built that does not lose at least 600,000 kilowatts of prime power capability, 3,700,000 acre-feet of storage capacity, and $8,800,000 of flood control and other benefits.

(2) Any one, or all of the run-of-river dams make full resource development impossible, and result in loss of both power and storage, as well as loss of flood control and navigation benefits.

(3) No combination of downstream storage with the run-of-river dams is as effective as either of the two combinations of dams that utilize the Hells Canyon site. In short, if the Hells Canyon storage capacity is wasted by construction of small dams, that loss will be permanent and cannot be recovered by any other combination of dams.

(4) Hells Canyon requires less capital investment than any other proposal, or combination of proposals, that will produce equivalent results.

(5) The power from Hells Canyon Dam is urgently needed, and that dam can be completed more quickly than any other of the large dams, such as the High Mountain Sheep or Nez Perce Dams.

(6) Hells Canyon is therefore the most effective and the best next development.

TABLE NO. 2.—*Detail of comparisons*

| Items | Hells Canyon alone | Hells Canyon plus Nez Perce | Hells Canyon plus Low Mountain Sheep | High Mountain Sheep plus 4 run-of-river | 5 run-of-river plants alone |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Cost, millions of dollars | | | | | |
| Dam | 356 | [1] 356 | [1] 356 | [2] 505 | |
| Do | | [3] 500 | [4] 352 | | |
| Tunnel | [5] | [5] | [6] 96 | [2] [6] 129 | Not practical. |
| Downstream [7] | 61 | 120 | 113 | 70 | None. |
| Federal | 417 | 976 | 917 | 713 | |
| Private | 0 | 0 | 0 | [8] 219 | $300 [8]; $134.[9] |
| Total | 417 | 976 | 917 | 932 | $300 [8]; $134.[9] |
| Total head utilized, feet | 602 | 1,182 | 1,127 | 1,125 | 600. |
| Hydraulic height, feet | 602 | [1] 602<br>[3] 615 | [1] 602<br>[4] 560 | [2] 739<br>[10] | 75 to 210. |
| Storage, active, millions of acre-feet: | | | | | |
| Dam | 3.9 | [1] 3.9 | [1] 3.9 | [2] 5.0 | None, and destroys storage opportunity. |
| Do | | [3] 4.8 | [4] 2.2 | | Do. |
| Total | 3.9 | 8.7 | 6.1 | 5.0 | |
| Prime power, million kilowatts | 1.1 | 2.5 | 2.2 | 1.9 | 0.5.[11] |
| Other benefits, millions of dollars (flood control, navigation, and recreation). | 43.5 | 57.4 | 49.6 | 48.6 | None. |
| Annual cost of power per kilowatt-year, dollars. | 15.62 | 16.38 | 17.13 | [12] 24.37 | $24.91 [12]; $27.14.[12] |
| Priority of plans for full resource development. | [13] | 1 | 2 | 3 | Run-of-river dams are not a part of either of the 2 best plans. |

NOTES

[1] Hells Canyon.
[2] High Mountain Sheep.
[3] Nez Perce.
[4] Low Mountain Sheep.
[5] Not needed.
[6] Tunnels to divert water from Salmon River into Mountain Sheep site.
[7] Additions to authorized downstream projects required for full utilization of storage from the upstream dams at Hells Canyon or Mountain Sheep.
[8] Rough estimates by Corps of Engineers for use in its reports.
[9] Figure given by Mr. Holland Houston as the cost, without transmission, for the 5 run-of-river dams. Department of Interior does not vouch for correctness of this figure, and, in fact, doubts that it is correct. However, the Department has no alternate figure it can submit, for it has not been given opportunity to see or analyze the plans or the cost data of the Idaho Power Co.
[10] 75 to 120 for run-of-river.
[11] The prime power of the run-of-river plants is 390,000 kilowatts on an isolated basis. This can be raised to 530,000 kilowatts, but only by integration of the plants with other utility systems and purchasing power. These added costs reflect, of course, in the annual power cost, as indicated below.
[12] The annual power cost figures shown in columns (4) and (5) are both higher than any of the costs in columns (1), (2), or (3), where Hells Canyon is a part of the plan. The figures in columns (4) and (5) are subject to considerable variation, depending upon whether it is assumed that:

(a) The cost of the run-of-river plants approximates the cost estimated by the Corps of Engineers, or the cost given by Mr. Houston, and whether

(b) They are presumed to be isolated plants without additional costs of integration and purchase, or, whether they are integrated, with those costs inherent. The Department of the Interior has no way of knowing those added costs, and the following figures are, therefore, lower than they would actually be when integration is presumed and the power company estimates are used. The minimum figure is, nevertheless, greater than the annual cost of power by any other combination. So that the record may be complete, they are shown, as follows:

(4) High Mountain Sheep plus 4 run-of-river plants:
- (*a*) Based upon Federal cost estimate of $219,000,000 ..... $24.37
- (*b*) Based upon Idaho Power Co. estimate shown in exhibit 2 of application to Federal Power Commission, December 1950 ..... 18.62

(5) 5 run-of-river plants
- (*a*) Based upon Idaho Power Co. cost estimate, isolated, with 390,000 kilowatts ..... 27.14
- (*b*) Based upon Idaho Power Co. cost estimate, integrated, with 530,000 kilowatts [14] ..... 19.97
- (*c*) Based upon Federal cost estimate, isolated, with 390,000 kilowatts ..... 33.85
- (*d*) Based upon Federal cost estimate, integrated, with 530,000 kilowatts [14] ..... 24.91

[13] Hells Canyon is essential part of both best plans.
[14] These do not include the added costs for integration and the purchase of power and are, therefore, lower than they would actually be.

## EXHIBIT C

### COMPARISON OF PRIME POWER CAPABILITY AND FINANCIAL ANALYSIS PRESENTED IN HOUSE DOCUMENT 473 WITH THOSE IN TESTIMONY ON H. R. 5743 IN HEARINGS BEFORE THE SUBCOMMITTEE ON IRRIGATION OF THE HOUSE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS, MARCH–APRIL, 1952

In response to the foregoing questions on power capability, costs, pay-out arrangements, and rates, there are explained below differences in these respects between the Hells Canyon report prepared in 1948 and presented in House Document 473 on the one hand, and on the other, in the report of the Commissioner of Reclamation of April 11, 1951, approved by the Secretary of the Interior on May 11, 1951, and in presentations to the subcommittee. It should be noted that the recommendations of House Document 473, Eighty-first Congress, were never put into effect by the Congress by reference to them in authorizing legislation. Accordingly, a revised submittal of only the Hells Canyon and initial features of the Mountain Home Division of the Snake River project was made by the Secretary of the Interior to the Congress by letter of October 8, 1951. That submittal included a draft of bill which has been introduced as H. R. 5743, and copies of the April 11, 1951, letter. Authorization is now being sought on the basis of the presentations contained in the Secretary's October 8 submittal, and as covered in more detail in testimony presented to the subcommittee, and not on the basis of the recommendations in House Document 473.

The type of pay-out showing presented in the regional director's report and substantiating materials in House Document 473 is not applicable in detail to current data, because the type of marketing arrangements currently proposed differ importantly from those used in that report for reasons discussed below. These marketing arrangements assumed in House Document 473, it should be noted, were rejected in the letter of transmittal from the Commissioner to the Secretary of June 9, 1948, which letter was approved by the Acting Secretary on the same date (printed at p. 113, H. Doc. 473, vol. 2). The Secretary confirmed that recommendation by his letter of July 20, 1949, to the President (p. 12, H. Doc. 473, vol. 1). The arrangements whereby pay-out was shown in House Document 473 are no longer applicable in view of changes in system assumptions and marketing arrangements, but a power-repayment study in connection with current data is provided to give information of a similar nature. Although a separate report from the regional director was not prepared in connection with the report from the Commissioner to the Secretary of April 11, 1951, the same staff of the regional director which prepared the report in House Document 473 developed the data for and participated in preparation of the Commissioner's April 11, 1951, report.

#### 1. PRIME POWER CAPABILITY

In House Document 473, there are presented the prime-power capabilities which the Hells Canyon development would have—(1) if operated on an isolated basis, independently from other Federal power plants in the Columbia River Basin, and (2) if added to and operated in coordination with the then authorized Columbia River system of Federal power plants as listed subsequently. Capabilities were computed on these two assumptions in order to show the advantages of system operation, and to develop the basis for the power-marketing arrangements which were contemplated at that time.

The capability figures placed before the committee in the course of these hearings relate only to coordinated operation, and as a part of a larger system. Capability on an isolated basis has not been used for reasons noted hereinafter.

Under conditions now in prospect, the prime power capability of the development, when added to and coordinated with the Federal power system consisting of those projects shown on the attached list, is 1,124,000 kilowatts. The figure of 854,000 kilowatts of system capability shown in House Document 473 was derived by a similar procedure. In each case, the total prime power capability of the system in prospect, was determined with and without Hells Canyon. The difference in the total production of the two systems represents the share of the system prime power capability assignable to Hells Canyon. This method of analysis is called the incremental method.

There also has been established, under conditions now in prospect, a prime power capability of 1,430,500 kilowatts based on an allocation method. This allocation of a portion of the total system prime power to Hells Canyon has no counterpart in the report on the project presented in House Document 473. For this reason, and because a full explanation of the 1,430,500-kilowatt alloca-

tion in relation to the 1,124,000-kilowatt capability derived by the incremental method is presented in a written statement submitted with the testimony of Mr. William A. Dittmer, power manager, Bonneville Power Administration on March 31, (see p. — of hearings) subsequent discussion of capability under conditions now in prospect is limited to the 1,124,000 figure.

*Capability with isolated operation*

The average prime power capability of 404,000 kilowatts shown in House Document 473 represents the average amount of power over a 50-year period which it was then estimated could be produced continuously at the Hells Canyon power plant if the project were operated as an isolated plant. This figure was derived to demonstrate that such isolated operation would be far less advantageous than operation of the development as an integral part of the Columbia River power system and for use in connection with pay-out and split marketing arrangements then contemplated. The upstream depletions and the plant efficiency used in determining this isolated prime power capability are the same as those described below in connection with the 854,000 system capability figure, but revised data for these factors of depletion and efficiency were used in determining the capabilities presented to the committee in the current hearings.

*Capability with coordinated operation*

The difference in prime power capabilities, obtained by the same incremental method, shown in House Document 473 (854,000 kws.) and used before the committee (1,124,000 kws.) is explained by the different conditions in prospect as of 1948 and those in prospect as of the present. The conditions involved are (1) prospective flows at the Hells Canyon site, (2) the efficiency to be attained by turbines and generators in converting falling water into electrical energy, and (3) the system to which Hells Canyon would be added.

With respect to prospective flows at the Hells Canyon site, two conditions served to increase the prime power capability over that presented in House Document 473. Studies of the effects of upstream irrigation and of return flows made for purposes of the report in House Document 473 were subsequently reexamined and refined by a subcommittee of the Columbia Basin Interagency Committee, including representatives of the States of the Pacific Northwest. This reexamination, particularly of the amount of return flows, indicated that diversions for new irrigated land would not reduce the prime power capability of Hells Canyon as much as had been assumed in the report in House Document 473. Secondly, the prospect for additional, new land development under Federal reclamation law seemed relatively bright in 1947–48 when that report was being prepared, with the result that an average of more than 50 percent of the ultimate total depletion from irrigation in the basin above the dam site was assumed to prevail during the project pay-out period. Subsequently, taking into account failure to obtain authorization for any of a dozen projects recommended in connection with an amendment to H. R. 5472 during 1949 and 1950, that figure was reduced to about 35 percent in view of the less optimistic outlook for Federal reclamation development.

In connection with the efficiency of turbines and generators, an over-all plant efficiency of 80 percent was used in determining the capability presented in House Document 473. Further experience at Grand Coulee Dam and at other Federal power plants indicated that higher efficiencies were being obtained. The efficiency accordingly was increased to 85 percent in determining the capability presented to the committee, with a resultant increase over the earlier capability.

The change of greatest importance in accounting for the higher capability under conditions now in prospect, however, is the change in the system to which Hells Canyon would be added. The system of major plants existing, under construction, and authorized at the time the report in House Document 473 was prepared, consisted of the nine following projects:

| | |
|---|---|
| Grand Coulee | Ice Harbor |
| Bonneville | Lower Monumental |
| Hungry Horse | Little Goose |
| Chief Joseph | Lower Granite |
| McNary | |

This is the system to which Hells Canyon was found to add 854,000 kilowatts.

The system in prospect early in the pay-out period of Hells Canyon has subsequently been increased by additional authorizations. Of particular importance was authorization of the John Day and the Dalles projects. The latter two developments are on the Columbia River below the mouth of Snake River.

Hence, storage releases from Hells Canyon would directly increase their prime power output. Libby, Albeni Falls, and Priest Rapids also were authorized in the Upper Columbia River as well as a number of lesser power developments in the Willamette River Basin. Counting small existing Federal plants in the Yakima and Snake River Basins, and a few small developments recommended for authorization in the Willamette and Snake River Basins, including the Scriver Creek power facilities, the system in prospect comprises a total of 33 projects before adding Hells Canyon (see accompanying tabulation). The capability of this system is increased far more by the addition of Hells Canyon than the smaller system of the report in House Document 473 which, notably, did not include the two major developments subsequently authorized on the Columbia below the mouth of Snake River (John Day and The Dalles) the prime power output of which will be substantially increased by storage releases from Hells Canyon.

In combination, then, enlargement of the prospective system to which Hells Canyon will be added, increases in plant efficiency, based upon operating experience, and a somewhat less adverse effect during the project pay-out period of upstream irrigation on streamflow indicated by further study and the less promising outlook for authorization of irrigation projects, serve to increase the prime power capability assignable to Hells Canyon from the 854,000 kilowatts shown in House Document 473 to the 1,124,000 kilowatts presented to and used before the committee.

*Power plants of the Federal Columbia River system existing, under construction, authorized and recommended*

| Plant | Status | Installed capacity | Usable storage |
|---|---|---|---|
| | | *Kilowatts* | *Acre-feet* |
| Hungry Horse | Under construction | 285,000 | 2,980,000 |
| Libby | Authorized | 588,000 | 4,250,000 |
| Albeni Falls | Under construction | 43,000 | 1,140,000 |
| Grand Coulee | Existing | 1,944,000 | 5,212,000 |
| Hells Canyon | Recommended | 900,000 | 3,880,000 |
| Chief Joseph | Under construction | 1,152,000 | |
| Priest Rapids | Authorized | 954,000 | [2] 2,100,000 |
| McNary | Under construction | 980,000 | |
| John Day | Authorized | 1,105,000 | [2] 2,000,000 |
| The Dalles | Under construction | 1,050,000 | |
| Bonneville | Existing | 518,000 | |
| Ice Harbor | Authorized | 260,000 | |
| Little Goose | do | 260,000 | |
| Lower Monumental | do | 240,000 | |
| Lower Granite | do | 220,000 | |
| Boise Diversion | Existing | 2,000 | |
| Black Canyon | do | 8,000 | |
| Minidoka | do | 13,000 | |
| Anderson Ranch | do | 27,000 | 464,000 |
| Palisades | Under construction | 112,000 | 1,200,000 |
| Upper Scriver | Recommended | 30,000 | |
| Lower Scriver | do | 90,000 | |
| Garden Valley | do | 60,000 | 843,000 |
| Roza | Authorized | 10,000 | |
| Chandler | do | 12,000 | |
| Hills Creek | do | 20,000 | 221,000 |
| Detroit | Under construction | 100,000 | 340,000 |
| Big Cliff | do | 18,000 | |
| Lookout Point | do | 115,000 | 368,000 |
| Dexter | do | 15,000 | |
| Cougar | Authorized [1] | 25,000 | 182,000 |
| Green Peter | do [1] | 81,000 | 322,000 |
| White Bridge | Recommended | 15,000 | |
| American Falls | Authorized | 30,000 | 1,700,000 |

[1] Power facilities not authorized.
[2] Flood control storage only.

## II. FINANCIAL ANALYSIS

Major differences in the financial treatment of Hells Canyon in House Document 473 and in current material provided to the committee center in the power marketing and pay-out arrangements contemplated. The regional director's report and substantiating materials for the Hells Canyon report in House Document 473 present dual marketing arrangements—the marketing of project power in the Snake River Basin being different from the marketing of project power in the lower Columbia River area. In the materials presented to the committee, on the

other hand, a single marketing and rate arrangement is contemplated which will be uniform for all project power and uniform for the Pacific Northwest. In connection with the dual arrangement set forth in the substantiating materials of the report in House Document 473, it should be noted that this arrangement was rejected in the report of the Commissioner of Reclamation dated June 9, 1948 (see p. 113, H. Doc. 473, vol. 2), transmitting the regional director's report and substantiating materials to the Secretary of the Interior, in view of the departmental decision to adopt a uniform marketing arrangement.

*Procedures in House Document 473*

The financial analysis in House Document 473 is based on the assumption that of the total prime power added by Hells Canyon to the then authorized system (854,000 kilowatts), an amount equivalent to that which could be produced at Hells Canyon if it were operated on an isolated basis (404,000 kilowatts) would be marketed in the Snake River Basin, and that the balance of the prime power (450,000 kilowatts) would be marketed in the lower Columbia River area. For the latter, over half of which would have been produced at down-river plants benefited by storage releases from Hells Canyon, it was assumed that the project would be credited with an annual return of $6,939,130. The aggregate receipts from this source over the pay-out period were estimated to be $368,521,930 from table 9. The balance of the gross revenues required for amortization, and for operation, maintenance, and replacements during the pay-out period ($734,916,332) was assigned for return from the salable firm power available from the 404,000 kilowatts of prime power capability as determined by isolated operation. It was found that an average rate of 4.4 mills per kilowatt-hour when applied to the salable firm power associated with the 404,000 kilowatts would return this part of the project cost.

*Current proposal*

The current proposal involves a single marketing and rate arrangement for all power added to the system by Hells Canyon. Irrespective of place of production, whether at the Hells Canyon plant or at benefited plants, and irrespective of market area, the power would become a part of total system production and be marketed as a part of that total production at uniform rates adequate to return both the system generation and system transmission costs.

As shown in the testimony by Mr. Ostrander, the annual generation costs for the 1,124,000 kilowatts of prime power added to the system by Hells Canyon would amount to $17,552,000 or approximately $15.62 per prime kilowatt. All costs associated with the generation of the entire share of the system's nominal prime output of 1,124,000 kilowatts assignable to Hells Canyon are included in these figures.

The annual generation costs, including amortization, are $14,330,000 for Hells Canyon and $3,222,000 for the generation at other plants assigned to Hells Canyon amounting to the afore-mentioned total of $17,552,000.

The amount of the system prime power added by Hells Canyon was determined for that condition of upstream river depletion reflecting the average acreage of new irrigation expected to be developed during the Hells Canyon pay-out period. Thus, it represents the average prime power during the pay-out period. Accordingly, annual revenues are estimated as being a constant amount after completion of the development period (9 years) rather than a gradually diminishing amount. As previously considered in House Document 473, no evaluation has been made for secondary and dump energy, relatively large amounts of which would be available during the early years of Hells Canyon operation.

The financial requirement of $15.62 per prime kilowatt must be obtained from revenues returned by the rates at which power will be marketed. On the basis of past experience of system operation projected to include future conditions, the amount of salable firm power corresponding to a nominal prime of 1,124,000 kilowatts is shown to be 1,463,400 kilowatts in the testimony presented by Mr. Ostrander. Annual generation costs on this basis are $11.99 per kilowatt of firm salable power and represent the generation cost at the load center after considering transmission losses, variation among customers as to the time of occurrence of their maximum demands (diversity factor) and the ratio of the customers' average use to maximum use (load factor). Transmission costs are, however, not included.

Because the uniform marketing policy will entail a transmission system common to all system power plants, specific transmission costs in that system chargeable to the 1,463,400 kilowatts of salable firm power are not separable. The average annual cost of system transmission is currently forecast on the basis of the existing Federal system at about $8 to $8.50 per kilowatt of salable firm power. Although

| 1 |
| --- |
| Year of Stud |
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| 48 |
| 49 |
| 50 |
| 51 |
| Totals |

# SNAKE RIVER PROJEC

## HELLS CANYON DIVISION

## PRELIMINARY POWER REPAYMEN

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Revenue Deductions | | | | Income Deductions | | |
| Year of Study | Nominal Prime Power Capability | Salable Firm Power | Financial Requirement @15.62/prime kw | Operation Maintenance & Overhead | Provision for Replacements | Total Cols. 5 + 6 | Net Operating Income Cols. 4-7 | 3% Interest | 2½ Interest | Principal Applied Col. 1 |
| | KW | KW | $ | $ | $ | $ | $ | $ | $ | $ |
| 0 | | | | | | | | | | |
| 1 | 654,000 | 851,500 | 10,215,480 | 1,431,000 | 1,182,000 | 2,613,000 | 7,602,480 | 4,700,790 | 264,550 | 2,528, |
| 2 | 977,000 | 1,272,100 | 15,260,740 | 1,511,000 | 1,202,000 | 2,713,000 | 12,547,740 | 9,325,722 | 521,211 | 2,483, |
| 3 | 1,030,000 | 1,341,100 | 16,088,600 | 1,723,000 | 1,222,000 | 2,945,000 | 13,143,600 | 9,251,229 | 544,169 | 2,972, |
| 4 | 1,070,000 | 1,393,100 | 16,713,400 | 1,793,000 | 1,241,000 | 3,034,000 | 13,679,400 | 9,156,057 | 1,031,543 | 3,006, |
| 5 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 9,073,370 | 1,147,530 | 2,713, |
| 6 | | | | | | | | 8,994,417 | 1,131,722 | 3,000, |
| 7 | | | | | | | | 8,894,136 | 1,118,014 | 3,096, |
| 8 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 8,801,247 | 1,103,745 | 3,389, |
| 9 | 1,070,000 | 1,393,100 | 16,713,400 | 1,793,000 | 1,241,000 | 3,034,000 | 13,679,400 | 8,705,571 | 1,089,114 | 3,284, |
| 10 | 1,124,000 | 1,463,400 | 17,552,000 | 1,949,000 | 1,275,000 | 3,224,000 | 14,328,000 | 8,607,025 | 1,074,118 | 4,032, |
| 11 | | | | | | | | 8,436,065 | 1,408,397 | 3,659, |
| 12 | | | | | | | | 8,370,271 | 1,389,549 | 3,768, |
| 13 | | | | | | | | 8,263,223 | 1,369,718 | 3,881, |
| 14 | | | | | | | | 8,146,763 | 1,349,392 | 3,993, |
| 15 | | | | | | | | 8,026,810 | 1,328,557 | 4,118, |
| 16 | | | | | | | | 7,903,258 | 1,307,201 | 4,241, |
| 17 | | | | | | | | 7,775,999 | 1,285,311 | 4,369, |
| 18 | | | | | | | | 7,644,923 | 1,262,874 | 4,500, |
| 19 | | | | | | | | 7,509,914 | 1,239,879 | 4,633, |
| 20 | | | | | | | | 7,370,855 | 1,216,303 | 4,774, |
| 21 | | | | | | | | 7,227,625 | 1,192,141 | 4,917, |
| 22 | | | | | | | | 7,080,097 | 1,167,375 | 5,065, |
| 23 | | | | | | | | 6,928,144 | 1,141,990 | 5,217, |
| 24 | | | | | | | | 6,771,632 | 1,115,970 | 5,373, |
| 25 | | | | | | | | 6,610,424 | 1,089,297 | 5,534, |
| 26 | | | | | | | | 6,444,381 | 1,061,762 | 5,700, |
| 27 | | | | | | | | 6,273,356 | 1,033,941 | 5,871, |
| 28 | | | | | | | | 6,097,200 | 1,005,220 | 6,044, |
| 29 | | | | | | | | 5,915,760 | 975,781 | 6,229, |
| 30 | | | | | | | | 5,728,876 | 945,000 | 6,416, |
| 31 | | | | | | | | 5,536,386 | 914,075 | 6,608, |
| 32 | | | | | | | | 5,338,122 | 882,973 | 6,807, |
| 33 | | | | | | | | 5,133,909 | 850,478 | 7,011, |
| 34 | | | | | | | | 4,923,570 | 817,170 | 7,222, |
| 35 | | | | | | | | 4,706,871 | 783,055 | 7,438, |
| 36 | | | | | | | | 4,483,741 | 748,061 | 7,661, |
| 37 | | | | | | | | 4,253,897 | 712,193 | 7,891, |
| 38 | | | | | | | | 4,017,157 | 675,428 | 8,128, |
| 39 | | | | | | | | 3,773,316 | 637,744 | 8,371, |
| 40 | | | | | | | | 3,522,159 | 599,118 | 8,622, |
| 41 | | | | | | | | 3,263,407 | 559,526 | 8,881, |
| 42 | | | | | | | | 2,997,015 | 518,945 | 9,148, |
| 43 | | | | | | | | 2,722,569 | 477,349 | 9,422, |
| 44 | | | | | | | | 2,439,890 | 434,713 | 9,705, |
| 45 | | | | | | | | 2,148,730 | 391,011 | 9,996, |
| 46 | | | | | | | | 1,848,836 | 346,215 | 10,296, |
| 47 | | | | | | | | 1,539,945 | 300,302 | 10,605, |
| 48 | | | | | | | | 1,221,787 | 253,240 | 10,923, |
| 49 | | | | | | | | 894,084 | 205,001 | 11,251, |
| 50 | | | | | | | | 556,550 | 155,556 | 11,588, |
| 51 | 1,124,000 | 1,463,400 | 17,552,000 | 1,949,000 | 1,275,000 | 3,224,000 | 14,328,000 | 208,890 | 104,876 | 6,963, |
| Totals | — | — | 879,029,220 | 97,231,000 | 64,602,000 | 161,833,000 | 717,146,220 | 295,016,479 | 44,378,541 | 313,340, |

ECT

ON

ENT STUDY

| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|
| ons | | Investment Repayment from Power Revenues | | | | | |
| | | Plant in Service at End of Year | | | | | |
| | | 3% Interest Bearing | | 2½% Interest Bearing | | | |
| cipal ied to . 14 | Principal Applied to Col. 16 | Commercial Electric Plant at Hells Canyon | Balance to be Repaid | Commercial Electric Plant at other projects | Balance to be Repaid | Earned Surplus Cumulative | Year of Study |
| $ | $ | $ | $ | $ | $ | $ | |
| | | 150,693,000 | 156,693,000 | 10,582,000 | 10,582,000 | | 0 |
| 523,589 | 104,551 | 313,386,000 | 310,857,411 | 20,957,000 | 20,848,449 | 0 | 1 |
| 483,115 | 217,692 | | 308,374,296 | 26,093,000 | 25,766,757 | | 2 |
| 972,333 | 275,819 | | 309,401,913 | 41,864,000 | 41,261,938 | | 3 |
| 006,043 | 479,752 | | 302,345,570 | 46,903,000 | 45,821,186 | | 4 |
| 213,359 | 543,435 | | 299,477,311 | | 45,277,751 | | 5 |
| 500,116 | 559,021 | | 270,471,195 | | 44,720,730 | | 6 |
| 596,299 | 570,947 | | 293,374,896 | | 44,149,783 | | 7 |
| 179,188 | 585,220 | | 290,189,708 | | 43,564,563 | | 8 |
| 284,864 | 599,851 | | 286,900,844 | 46,903,000 | 42,964,712 | | 9 |
| 032,010 | 614,847 | | 282,868,834 | 60,909,000 | 56,355,865 | | 10 |
| 659,146 | 773,892 | | 279,209,688 | | 55,581,973 | | 11 |
| 768,920 | 793,240 | | 275,440,798 | | 54,738,733 | | 12 |
| 881,988 | 813,071 | | 271,558,780 | | 53,975,662 | | 13 |
| 713,448 | 833,397 | | 267,560,332 | | 53,142,265 | | 14 |
| 118,401 | 854,232 | | 263,441,931 | | 52,238,033 | | 15 |
| 241,933 | 875,588 | | 259,199,973 | | 51,412,445 | | 16 |
| 369,212 | 897,478 | | 254,830,766 | | 50,514,967 | | 17 |
| 500,238 | 919,915 | | 250,330,478 | | 49,595,052 | | 18 |
| 633,297 | 942,913 | | 245,695,181 | | 48,652,139 | | 19 |
| 774,356 | 966,486 | | 240,920,825 | | 47,685,653 | | 20 |
| 917,516 | 990,648 | | 236,003,239 | | 46,695,005 | | 21 |
| 065,114 | 1,015,414 | | 230,937,125 | | 45,679,591 | | 22 |
| 217,067 | 1,040,799 | | 225,721,038 | | 44,638,792 | | 23 |
| 373,579 | 1,066,819 | | 220,347,479 | | 43,571,973 | | 24 |
| 534,737 | 1,093,490 | | 214,812,692 | | 42,478,483 | | 25 |
| 700,830 | 1,120,827 | | 209,111,362 | | 41,357,656 | | 26 |
| 871,855 | 1,148,848 | | 203,240,007 | | 40,208,808 | | 27 |
| 048,011 | 1,177,569 | | 197,191,996 | | 39,031,239 | | 28 |
| 229,451 | 1,207,008 | | 190,962,545 | | 37,824,231 | | 29 |
| 416,335 | 1,237,183 | | 184,546,210 | | 36,587,048 | | 30 |
| 608,825 | 1,268,113 | | 177,937,385 | | 35,318,935 | | 31 |
| 807,089 | 1,299,816 | | 171,130,296 | | 34,019,119 | | 32 |
| 011,302 | 1,332,311 | | 164,118,994 | | 32,686,808 | | 33 |
| 222,641 | 1,366,619 | | 156,896,353 | | 31,322,189 | | 34 |
| 438,320 | 1,377,734 | | 149,456,033 | | 29,922,455 | | 35 |
| 661,470 | 1,434,728 | | 141,790,593 | | 27,487,727 | | 36 |
| 891,314 | 1,470,996 | | 133,905,249 | | 27,017,131 | | 37 |
| 121,054 | 1,507,861 | | 125,772,195 | | 25,509,770 | | 38 |
| 371,899 | 1,545,349 | | 117,448,300 | | 23,964,725 | | 39 |
| 633,252 | 1,583,471 | | 108,782,248 | | 22,381,054 | | 40 |
| 731,744 | 1,623,263 | | 99,900,504 | | 20,757,791 | | 41 |
| 148,176 | 1,663,344 | | 90,752,308 | | 19,093,947 | | 42 |
| 422,642 | 1,705,440 | | 81,329,066 | | 17,388,507 | | 43 |
| 705,321 | 1,748,076 | | 71,624,345 | | 15,640,431 | | 44 |
| 996,431 | 1,791,778 | | 61,627,364 | | 13,848,653 | | 45 |
| 296,375 | 1,836,573 | | 51,331,439 | | 12,012,080 | | 46 |
| 605,266 | 1,882,487 | | 40,726,223 | | 10,129,593 | | 47 |
| 923,424 | 1,929,549 | | 29,802,799 | | 8,200,044 | | 48 |
| 251,127 | 1,977,788 | | 18,551,672 | | 6,222,256 | | 49 |
| 588,661 | 2,027,233 | | 6,963,011 | | 4,195,023 | 0 | 50 |
| 963,011 | 4,195,023 | 313,386,000 | 0 | 60,909,000 | 0 | 2,856,200 | 51 |
| 386,000 | 60,909,000 | 313,386,000 | 0 | 60,909,000 | 0 | 2,856,200 | Totals |

NOTES:

Col. 2 Amount of nominal prime power capability added to the "Columbia River Power System" by reason of the construction of Hells Canyon. The system on which these figures are based consists of 15 major and 19 minor Federal hydroelectric plants.

Col. 3 Salable firm power is calculated by using a 75% load factor, a 1.05 diversity factor, and 7% losses.

Cols. 5, 6, 13, & 15:

| Plant | O&M | Provision for Replacements | Commercial Electric Plant ** |
|---|---|---|---|
| Chief Joseph | $216,000 | $40,000 | $10,375,000 |
| Priest Rapids | 90,000 | 34,000 | 8,300,000 |
| McNary | 70,000 | 37,000 | 5,188,000 |
| John Day | 66,000 | * | 5,706,000 |
| The Dalles | 132,000 | * | 10,375,000 |
| Ice Harbor | 80,000 | 20,000 | 5,394,000 |
| Lower Monumental | 80,000 | 20,000 | 5,136,000 |
| Little Goose | 80,000 | 20,000 | 5,396,000 |
| Lower Granite | 70,000 | 19,000 | 5,039,000 |
| Subtotals | $884,000 | $190,000 | $60,909,000 |
| Hells Canyon | 1,065,000 | 1,085,000 | 313,386,000 |
| Totals | $1,949,000 | $1,275,000 | $374,295,000 |

* Replacements included in O&M costs.

** Costs include interest during construction except for Hells Canyon.

Col. 13 Proposed allocation of Hells Canyon costs:

| | |
|---|---|
| Power | $313,386,000 |
| * Flood Control | 37,561,000 |
| * Navigation | 4,863,000 |
| * Recreation | 1,000,000 |
| ** Total | $356,810,000 |

* Nonreimbursable.

** Excludes cost, not to exceed $5,000,000, of migratory fish preservation facilities.

U.S.B.R. - Region I
Boise, Idaho
May 1952

# SNAKE RIVER PROJEC

## MOUNTAIN HOME DIVISION(Paye

## Scriver Creek Power Facili

## PRELIMINARY POWER REPAYME

### Initial Stage of Development

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Revenue Deductions | | | | Income Deductions | | Inv |
| Year of Study | Nominal Prime Power Capability | Salable Firm Power | Revenue Requirement | Operation Maintenance & Overhead | Provision for Replacements | Total Cols. 5 & 6 | Net Operating Income Cols. 4-7 | @ Interest | Principal | Interest Commercial Electric Plant |
| | KW | KW | $ | $ | $ | $ | $ | $ | $ | $ |
| 0 | | | | | | | | | | |
| 1 | 70,200 | 99,200 | 1,380,100 | 202,800 | 173,000 | 371,000 | 1,514,300 | 1,101,390 | 345,410 | 34,963,00 |
| 2 | | | | | | | | 1,138,521 | 334,772 | |
| 3 | | | | | | | | 1,147,855 | 300,445 | |
| 4 | | | | | | | | 1,150,301 | 277,439 | |
| 5 | | | | | | | | 1,[illegible],233 | 3[illegible],762 | |
| 6 | | | | | | | | 1,213,375 | 400,625 | |
| 7 | | | | | | | | 1,201,762 | 422,438 | |
| 8 | | | | | | | | 1,[illegible],487 | 424,311 | |
| 9 | | | | | | | | 1,179,745 | 437,355 | |
| 10 | | | | | | | | 1,061,618 | 456,982 | |
| 11 | | | | | | | | 1,050,093 | 464,202 | |
| 12 | | | | | | | | 1,039,172 | 478,128 | |
| 13 | | | | | | | | 1,021,823 | 494,472 | |
| 14 | | | | | | | | 1,[illegible],054 | 507,240 | |
| 15 | | | | | | | | 771,830 | 522,204 | |
| 16 | | | | | | | | 770,162 | 539,333 | |
| 17 | | | | | | | | 908,014 | 554,282 | |
| 18 | | | | | | | | 943,390 | 570,910 | |
| 19 | | | | | | | | 926,263 | 583,037 | |
| 20 | | | | | | | | 908,021 | 603,979 | |
| 21 | | | | | | | | 580,452 | 623,349 | |
| 22 | | | | | | | | 871,730 | 642,304 | |
| 23 | | | | | | | | 852,439 | 661,341 | |
| 24 | | | | | | | | 832,003 | 681,077 | |
| 25 | | | | | | | | 8[illegible],153 | 702,147 | |
| 26 | | | | | | | | 774,088 | 723,212 | |
| 27 | | | | | | | | 789,332 | 744,908 | |
| 28 | | | | | | | | 747,045 | 767,255 | |
| 29 | | | | | | | | 724,027 | 790,273 | |
| 30 | | | | | | | | 700,319 | 813,981 | |
| 31 | | | | | | | | 973,397 | 333,401 | |
| 32 | | | | | | | | 936,747 | 803,553 | |
| 33 | | | | | | | | 924,841 | 889,459 | |
| 34 | | | | | | | | 578,157 | 910,143 | |
| 35 | | | | | | | | 5[illegible],[illegible]73 | 9[illegible],[illegible]67 | |
| 36 | | | | | | | | 542,364 | 971,936 | |
| 37 | | | | | | | | 513,206 | 1,001,094 | |
| 38 | | | | | | | | 483,173 | 1,031,127 | |
| 39 | | | | | | | | 452,239 | 1,062,061 | |
| 40 | | | | | | | | 420,377 | 1,093,923 | |
| 41 | | | | | | | | 387,560 | 1,126,740 | |
| 42 | | | | | | | | 353,757 | 1,160,543 | |
| 43 | | | | | | | | 318,941 | 1,195,359 | |
| 44 | | | | | | | | 283,080 | 1,231,220 | |
| 45 | | | | | | | | 246,144 | 1,268,156 | |
| 46 | | | | | | | | 208,099 | 1,306,201 | |
| 47 | | | | | | | | 168,913 | 1,345,387 | |
| 48 | | | | | | | | 128,551 | 1,385,749 | |
| 49 | | | | | | | | 86,979 | 1,427,321 | |
| 50 | | | | | | | | 44,157 | 1,470,141 | |
| 51 | | | | | | | | 55 | 1,525 | |
| 52 | | | | | | | | 0 | 0 | |
| 53 | | | | | | | | 0 | 0 | |
| 54 | 70,200 | 99,200 | 1,380,100 | 202,800 | 173,000 | 371,000 | 1,514,300 | 0 | 0 | 34,992,0 |
| Totals | — | — | 102,[illegible],600 | 20,[illegible],200 | 17,[illegible],000 | 37,[illegible],200 | 32,772,200 | 30,753,390 | 34,963,000 | 34,992,0 |

# ECT
## ayette Unit)
## cilities
## MENT STUDY
### nt

| 1 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|
| | Investment Repayment Data for Power Revenues | | | Allocated Unpaid Balance | | | |
| | Plant in Service at End of Year | | | | | | |
| | Interest Bearing | Interest Free | | | | | |
| rcial tric nt | Balance to be Repaid | Irrigation Plant | Balance to be Repaid | Commercial Electric Plant | Irrigation Plant | Earned Surplus (Cumulative) | Year of Study |
| | $ | $ | $ | $ | $ | $ | |
| | 38,963,000 | 0 | 0 | 38,963,000 | 0 | 0 | 0 |
| 63,000 | 38,617,590 | | | | | | 1 |
| | 38,201,418 | | | | | | 2 |
| | 37,895,373 | | | | | | 3 |
| | 37,527,934 | | | | | | 4 |
| | 37,124,172 | | | | | | 5 |
| | 36,723,428 | | | | | | 6 |
| | 36,329,309 | | | | | | 7 |
| | 35,921,498 | | | | | | 8 |
| | 35,453,742 | | | | | | 9 |
| | 35,001,261 | | | | | | 10 |
| | 34,537,057 | | | | | | 11 |
| | 34,060,931 | | | | | | 12 |
| | 33,561,459 | | | | | | 13 |
| | 33,061,213 | | | | | | 14 |
| | 32,538,747 | | | | | | 15 |
| | 32,000,611 | | | | | | 16 |
| | 31,448,329 | | | | | | 17 |
| | 30,873,419 | | | | | | 18 |
| | 30,297,332 | | | | | | 19 |
| | 29,694,792 | | | | | | 20 |
| | 29,057,834 | | | | | | 21 |
| | 28,415,290 | | | | | | 22 |
| | 27,733,449 | | | | | | 23 |
| | 27,072,734 | | | | | | 24 |
| | 26,387,865 | | | | | | 25 |
| | 25,646,393 | | | | | | 26 |
| | 24,901,435 | | | | | | 27 |
| | 24,134,430 | | | | | | 28 |
| | 23,343,957 | | | | | | 29 |
| | 22,523,470 | | | | | | 30 |
| | 21,691,575 | | | | | | 31 |
| | 20,828,022 | | | | | | 32 |
| | 19,938,963 | | | | | | 33 |
| | 19,022,420 | | | | | | 34 |
| | 18,077,793 | | | | | | 35 |
| | 17,106,357 | | | | | | 36 |
| | 16,105,763 | | | | | | 37 |
| | 15,074,639 | | | | | | 38 |
| | 14,012,575 | | | | | | 39 |
| | 12,914,652 | | | | | | 40 |
| | 11,781,712 | | | | | | 41 |
| | 10,632,369 | | | | | | 42 |
| | 9,436,010 | | | | | | 43 |
| | 8,204,770 | | | | | | 44 |
| | 6,939,034 | | | | | | 45 |
| | 5,630,473 | | | | | | 46 |
| | 4,283,046 | | | | | | 47 |
| | 2,899,241 | | | | | | 48 |
| | 1,471,770 | | 0 | 38,963,000 | 0 | | 49 |
| | 2,739 | 5,911,000 | 5,911,000 | 0 | 5,911,000 | | 50 |
| | 0 | | 4,398,570 | | | | 51 |
| | 0 | | 2,384,290 | | | | 52 |
| | 0 | | 1,309,790 | | | 0 | 53 |
| 2,000 | 0 | 5,911,000 | 0 | 0 | 5,911,000 | 144,320 | 54 |
| 2,000 | 0 | 5,911,000 | 0 | 0 | 5,911,000 | 144,320 | Totals |

NOTES: For the purpose of determining the financial requirements for power and energy at the high side of the transformers in the powerplant switchyard, the cost of transmission facilities to carry power to the load centers ($8,850,000) has been omitted from this analysis. The addition of these facilities to the above costs would result in a total revenue requirement of $2,473,500 and a net income amount of $1,858,300.

Cols.2 & 3 Capabilities shown in Cols. 2 & 3 are based upon integration with the Columbia River Power System.

Col. 4 Amounts required to cover estimated O&M and Provision for Replacements costs and repayment of investment allocated to be returned from power revenues with 3% interest.

Cols.5 & 6 Operation, Maintenance, and Overhead estimates are based on Bureau's experience in operating plants of similar size. Provision for Replacements estimated on 3%-50 year sinking fund basis.

| | O&M | Prov.for Repl. |
|---|---|---|
| Cascade Dam and Reservoir | $6,000 | $1,200 |
| Smith's Ferry Diversion Dam | 3,000 | 300 |
| Smith's Ferry-Scriver Cr.Tunnel | 2,500 | 1,000 |
| Scriver Creek Dam & Reservoir | 3,000 | 700 |
| Scriver Cr.-Garden Valley Tunnel | 1,300 | 1,300 |
| Upper Scriver Powerplant | 81,000 | 51,300 |
| Lower Scriver Powerplant | 105,000 | 73,000 |
| Upper Scriver Switchyard | * | 15,300 |
| Lower Scriver Switchyard | * | 17,600 |
| General Property | - | 8,100 |
| | $201,800 | $170,000 |

* Included in powerplant amount

Cols.11 & 13 The cost allocations used are as follows:

| | |
|---|---|
| Power | $38,963,000 1/ |
| Irrigation | 5,911,000 |
| Fish and Wildlife | 50,000 2/ |
| Recreation | 61,000 3/ |
| Total cost | $44,985,000 |

1/ Does not include $8,850,000 for transmission facilities.

2/ Portion of Cascade Reservoir allocated to Scriver Creek facilities.

3/ Fish screens and recreation facilities—nonreimbursable.

U.S.B.R. - Region I
Boise, Idaho
May 1952

# SNAKE RIVER PROJECT

## MOUNTAIN HOME DIVISION(Payette Unit)

## Scriver Creek Power Facilities

## PRELIMINARY POWER REPAYMENT STUDY

### Initial Stage of Development

specific, incremental costs would, no doubt, be somewhat less, if they could be determined, use of the above transmission costs would result in a total of $20 to $20.50 per kilowatt of salable firm power.

Under a uniform rate for the entire area served by the interconnected Federal system, no separate rate is applicable to the power resulting from any specific project. The rates will be at levels sufficiently high to return not only the Hells Canyon costs but also the total system generation and transmission costs. The existing, basic rate, which will continue to be adequate for such purposes for some time to come, is expressed as $17.50 per kilowatt-year of salable firm power. The Bonneville Power Administration has indicated that it may be necessary to adopt by the end of 1959 a somewhat higher rate.

The attached repayment study covering the Hells Canyon division shows the pay-out of this portion of the project within a 51-year period with a surplus of $2,856,200, and is summarized as follows:

| | | |
|---|---|---|
| Financial requirements from operating revenues for repayment period | | $879,029,220 |
| Revenue deductions for repayment period: | | |
| Operation, maintenance, and overhead | $97,281,000 | |
| Provision for replacement | 64,602,000 | |
| | | 161,883,000 |
| Net to apply on repayment of capital costs | | 717,146,220 |
| Construction cost | $374,295,000 | |
| Interest on construction cost during repayment period | 339,995,020 | |
| | | 714,290,020 |
| Surplus | | 2,856,200 |

Also attached is a pay-out study covering the Scriver Creek power facilities of the Mountain Home division showing pay-out in the fifty-fourth year with a surplus of $144,310.

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## Exhibit D

### Reply to the Testimony of Holland Houston, Consulting Engineer, April 3, 1952

At the hearing on H. R. 5743, April 3, 1952, before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, House of Representatives, Chairman Clair Engle requested that the Department of the Interior comment on the five criticisms made against the proposed Hells Canyon Dam by witness Holland Houston.

Mr. Houston's five criticisms were:

1. That the power benefits from Hells Canyon have been overstated because as Northwest river development progresses from phase C–2 to phase D in the programs of the Army engineers, then the power accredited to Hells Canyon Dam will decline substantially.
2. That Hells Canyon will contribute little to flood control. Other rivers must be dammed for that purpose.
3. That the cost of Hells Canyon power has been seriously understated, both with respect to generation and to transmission. The true costs are too high for the dam to be feasible.
4. That another dam, Kooskia, on the Clearwater River could be built that would give more flood control, and in combination with the five dams proposed by the Idaho Power Co., more power than Hells Canyon Dam.
5. That Kooskia Dam would avoid the controversy over whether water necessary for future irrigation will be available if Hells Canyon is built.

The Department's reply is summarized as follows:

1. The amount of power from Hells Canyon Dam has been correctly estimated by the Department. Mr. Houston's criticisms are invalid and contrary to accepted engineering and business practice.
2. Hells Canyon Dam will contribute significantly to flood control as would dams on other rivers. To obtain the maximum feasible flood control, storage at all possible dams is necessary, each of which will make some contribution, varying in amount. Hells Canyon Dam is an essential component in the present over-all program of the Army engineers for flood control.

3. The cost of Hells Canyon power has not been misrepresented by the Department with respect either to generation or transmission. Mr. Houston's own computations are in error and are not in accord with accepted engineering and business practice.

4. What contribution Kooskia Dam would make to flood control is beside the point. The comparison of power generation from Hells Canyon Dam on the one hand and Kooskia combined with the five Idaho power dams on the other is invalid because both Hells Canyon and Kooskia Dams could and should be built in due course. There would be no mutual conflict, and this combination would supply much more power than Kooskia and the five company dams. Hence, the only correct comparison is the original one between Hells Canyon and the five company dams.

5. It is true that Kooskia Dam would avoid the controversy over water depletion present in the case of Hells Canyon Dam, but precisely the same situation applies with reference to the five company dams. The Department has shown that maximum allowance for feasible upstream depletions for irrigation will have only a minor effect on the amount of power which can be produced at Hells Canyon.

*1. Power benefits from Hells Canyon Dam in relation to the phase C–2 and phase D programs*

In 1950 the Corps of Engineers and the Department of the Interior, in a joint report to the Congress, recommended early construction of several major dams on the Columbia River and its tributaries, which when added to system of dams then existing, under construction, and authorized would control floods in the Lower Columbia River to 800,000 second-feet and would provide sufficient generating capacity (totaling 10,000,000 kilowatts) to meet the forecasted power loads of the Northwest. The Hells Canyon Dam was among that list of dams which was designated as the phase C–2 level of power development. Those proposed dams were selected after many extensive investigations and engineering studies and holding public hearings on many alternate sites. The economic feasibility of adding each of those dams to the then authorized system was demonstrated beyond a doubt and as a result all but two of them were authorized by the Rivers and Harbors Act of 1950. The authorization of the Glacier View Dam was not recommended because of encroachment on a national park, and the amendment to the 1950 Rivers and Harbors Act which would have authorized the Hells Canyon Dam as a reclamation project was tabled because of a controversy over the method provided in it to furnish financial assistance to irrigation from power revenues. If Hells Canyon had been recommended for construction by the Corps of Engineers, it, too, might well have been authorized in 1950.

In selecting the projects to be included in the C–2 level of development, two rigid criteria had to be met, i. e., they had to be economically feasible and there should be no serious objection to their early construction. Hells Canyon met both criteria at the time it was selected and, except for the opposition by the Idaho Power Co., still meets them, mainly because the reservoir area is relatively uninhabited, does not contain valuable mineral resources, and is not traversed by main-line railroads or cross-country highways, and the dam will not interfere seriously with migratory fish runs. Several attractive flood-control and power projects, which were and still are economically feasible, had to be deferred because of serious local and other opposition to their construction on the grounds of flooding agricultural land, towns, railroads, highways, or mines, or interfering with migratory fish runs. These and several higher cost projects investigated at the time were, therefore, relegated to the so-called phase D level of development, to which Mr. Houston referred. Generally, the projects relegated to the phase D level of development may thus be regarded as presenting problems not capable of present solution and likely to be built, therefore, only in the more distant future when solutions of these problems have been found, and in other cases when higher costs of power will be justified.

Neither the Army engineers nor the Department of the Interior can check the estimate of 719,500 kilowatts assigned to Hells Canyon Dam at the phase D level as Mr. Houston did in his testimony (transcript, p. 646). Assuming, for the moment, the correctness of this figure, which we question, his use of it is incorrect and is inconsistent with established engineering and business practice. It is not proper to appraise the feasibility of Hells Canyon Dam now by taking a figure of 719,500 kilowatts or any other figure on the assumption that this would be the amount of prime power Hells Canyon would add to a nebulous system of power plants at the phase D level of development. It is not proposed that Hells Canyon Dam be built during the phase D level of development when different conditions,

costs, and benefits would exist. Instead, it is proposed for construction now as a part of the phase C–2 system of power plants. The Department of the Interior can demonstrate conclusively by system production studies that the addition of Hells Canyon Dam and power plant to the presently authorized system of power plants will increase the prime power capability of that system by 1,124,000 kilowatts—a figure which Mr. Houston accepted. The Congress should appraise the feasibility of constructing Hells Canyon Dam on the basis of this figure.

All of the major dams on the Columbia River thus far authorized by Congress and built or under construction have had their economic feasibility determined by the existing and expected conditions surrounding each at the time of its authorization. The amount of prime power that each of those dams would add to the then existing and authorized power system—not some future unauthorized system—was a major factor in determining its economic feasibility. Dams proposed in the future, including those of the so-called phase D, will have their feasibility determined on the basis of the contribution which they can make to the then authorized system. As such a program continues, existing and already authorized dams must be taken as a fact with the additional costs and additional benefits resulting from a proposed dam computed on that basis. This is accepted engineering and business practice.

When the power and flood-control needs of the Northwest have increased to the point where it is necessary to expand the system of dams to the phase D level, a complete restudy of that group of dams will be required to determine their relative feasibility under those future economic conditions. By that time, storage developments in Canada may vitally alter the size, selection and economics of the projects in phase D. The economics of Hells Canyon will have already been determined then and, if the power contribution of Hells Canyon were to be reduced by the addition of phase D dams as Mr. Houston implies, although we do not agree that it will be, those dams will be justified only if the total benefits they add, less the reduction in power attributable to Hells Canyon, would cover their costs better than any other available alternative.

It must be noted, however, that the Army engineers have made some studies of Hells Canyon Dam in relation to certain projects of phase D in this section of the Snake River. They have also studied the dams proposed by the Idaho Power Co. It was concluded, according to testimony of Mr. Gordon Fernald of the Corps of Engineers, before this committee on March 31, 1952, that Hells Canyon Dam is an essential part of the two best plans, i. e., Nez Perce Dam with Hells Canyon Dam and Mountain Sheep Dam with Hells Canyon Dam. The Idaho Power Co.'s proposed run-of-river dams are in the least attractive plan. Furthermore, a decision to allow the Idaho Power Co. to construct its proposed five low dams would deprive the region and the country for many years of some 600,000 additional kilowatts that could be obtained from construction of Hells Canyon Dam. Such a loss would be the equivalent to throwing away one Bonneville Dam. With the scarcity of available sites where such a large block of power can be developed, the American people cannot afford such a loss.

*2. Hells Canyon and flood control.*

Mr. Houston points out that other rivers—the Salmon and the Clearwater—have larger flows of water than at Hells Canyon and argues that Hells Canyon therefore will make no significant contribution to flood control (transcript, p. 661). This conclusion does not at all follow.

It is true that other rivers may have larger flows and should also be regulated for flood control to the extent economically justified. But dealing with Hells Canyon, the Army engineers point out that of 27 million acre-feet necessary for reasonable control of Columbia River floods, the 3,880,000 acre-feet of storage at Hells Canyon will provide complete control of the Snake River for flood-control purposes at that point. The annual flood-control value of the 3,880,000 acre-feet of storage at Hells Canyon is computed by the Army engineers at $1,459,800 out of a total of $16,191,800 creditable to the entire control plan. The capitalized value of flood control assigned to Hells Canyon as computed by the Army engineers is $37,561,000. As of April 18, 1952, the Army engineers have advised the Bonneville Power Administration that they find no reason to alter their finding that Hells Canyon project will "result in material flood-control benefits to the lower river areas." (See letter attached from Col. E. C. Itschner, division engineer, to Dr. Paul J. Raver, Bonneville Power Administrator.)

Mr. Houston asserted that the Snake River already is under substantial storage control, stating that the storage is "over 76 percent of the mean annual runoff * * *" (transcript, p. 639). Mr. Houston's statement is misleading because he argued that flood control already is substantially provided for by this

storage on the Snake. This is not true because the storage he referred to is primarily for irrigation purposes and the studies of the Army engineers show that Hells Canyon will contribute to flood control in the amounts already referred to even after the maximum practicable flood control is provided at the headwater reservoirs. After making full allowance for upstream storage of the 1894 flood, in all existing and authorized storage projects, they found that there would still be 2,600,000 acre-feet passing through Hells Canyon while the flow on the Columbia at The Dalles was above 8000,000 cubic feet per second. This volume can and must be stored in Hells Canyon Reservoir.

Mr. Houston also asserted (transcript, p. 661) that the flood of 1894 would not be repeated. This flood had a maximum flow of about 1,240,000 cubic second-feet at The Dalles, Oreg., and an estimated flow of 130,000 cubic feet per second from the Snake River at Oxbow. The Army engineers and the Bureau of Reclamation both believe that the 1894 flood can be exceeded, as evidenced by the spillway capacity provided for in the design of Hells Canyon Dam and at other dams located along this general reach of the Snake River. The fact that a flow estimated at over 90,000 cubic feet per second occurred this spring at Oxbow should also give pause to any assertions that such flows cannot reoccur. In view of the fact that the recent flood on the Missouri River exceeds all previously measured floods, it is evident that the prudence of the Army engineers is wise, and that Mr. Houston's assertion is not a safe guide for congressional policy.

*3. The costs of Hells Canyon power*

Three statements by Mr. Houston bear particularly upon costs. (A) He objected to the Department's figure of $15.49 per kilowatt-year of prime power credited to Hells Canyon Dam and said it should be $31 on one basis of computation and $35.20 on another basis (transcript, pp. 664, 665, and 672). (B) He asserted that the incremental cost of Hells Canyon power, as compared to the cost of power from the five dams proposed by the Idaho Power Co., would be the uneconomical figure of $55.50 per kilowatt year (transcript, pp. 685 and 692–K). (C) He also criticized the Department's estimate of transmission costs of 1 mill per kilowatt-hour of Hells Canyon power by asserting that while this may be true at high load factors, if the load factor dropped to 50 percent the cost would be 2 mills per kilowatt-hour (transcript, p. 676).

Every one of these assertions by Mr. Houston is incorrect or misleading and is based on assumptions or procedures that depart widely from accepted practices in engineering and business.

(*A*) *Which figure, $15.49, or $31 and $35.20 per kilowatt-year?*—The Department computed the annual generation cost per kilowatt-year of Hells Canyon power by the commonly used method of totaling all of the costs charged to generate the power attributed to Hells Canyon Dam and dividing that total by the amount of power.

The amount of power is 1,124,000 prime kilowatts, consisting of 688,000 credited to the Hells Canyon plant, and 436,000 kilowatts credited to downstream power plants and system operations benefiting from water released at Hells Canyon Dam and from integration. The cost of generating this amount of system power consists of (1) the costs of Hells Canyon Dam charged to power, and (2) the costs of adding power facilities to other dams to utilize the storage releases and maintain adequate system peaking to utilize the increased prime power production. These costs, on an annual basis, when divided by 1,124,000 kilowatts, give the figure of $15.49, and recomputed on a more recent price level to $15.62, in the statement filed with the committee by Earl D. Ostrander, Controller, Bonneville Power Administration.

Mr. Houston's procedure is quite different and contains several basic errors. He overstates the investment cost and understates the amount of power, a compounding of errors resulting in a grossly excessive estimate of cost per kilowatt. Instead of dealing with only the system to which Hells Canyon is to be added, he considers additional plants not now considered for early authorization and arrives at a figure for increased production amounting to 969,000 kilowatts. The derivation of this figure is not clearly explained, but inasmuch as he sets it forth in parallel with the 1,124,000 kilowatt figure (see p. 646 of transcript) we assume that it includes as assigned figure for at-site production at Hells Canyon and an increment of power due to Hells Canyon storage utilized at the four Lower Snake River dams and at other downstream plants. The costs that he compared with this figure, were the entire costs estimated for Hells Canyon Dam, $356 million plus his figure of $30 million for interest during construction plus an estimated $390 million for the entire costs of the four Lower Snake dams. These total costs

were used notwithstanding the fact that they include component parts that are to be constructed for and, therefore, should be chargeable specifically to navigation, flood control, and recreation, including navigation locks at the Lower Snake River dams. On the other hand, he understated substantially the amount of power produced at the Lower Snake River dams because he included in his figure only the increment of prime power added at the Lower Snake River plants by the use of Hells Canyon storage, but omitted the more than 500,000 kilowatts of prime power which could be produced at those plants as run-of-the-river plants without Hells Canyon storage. Such compounding of errors completely discredits and makes meaningless his figure of $35.20. The correct approach is given in Mr. Ostrander's statement.

(B) *Is the incremental cost of Hells Canyon power $55.50 per kilowatt-year?*—Mr. Houston made equally basic errors in arriving at an estimate of the cost of $55.50 per kilowatt-year for the incremental amount of power attributed by him to Hells Canyon Dam over the amount from the five dams proposed by the Idaho Power Co.

He asserted that the cost of the five dams is estimated by the Idaho Power Co. at $133,874,000 and the cost of Hells Canyon at $386,000,000. At phase D level, he states that Hells Canyon will contribute to the system 715,500 continuous kilowatts. (Transcript, p. 692–K.)[1] He concludes that the 715,500 kilowatts is 158,500 more kilowatts than the contribution by the five private dams, and that the cost of this increment is the extra cost of Hells Canyon above the five dams, or $252,000,000. He adjusts this figure down to $200,000,000, resulting in a cost of $55.50 per kilowatt-year. This figure he says is excessive (as indeed it would be if it were correct), far above the cost of "junk" steam power.

The following observations are sufficient to disclose the lack of merit in Mr. Houston's testimony:

(1) The Bonneville Power Administration has checked with the Army engineers, and neither is able to verify Mr. Houston's figure of 715,500 kilowatts assigned to Hells Canyon under the phase D program. The derivation of this figure is not known.

(2) The cost estimate of $133,874,000 given by Mr. Houston (transcript p. 692–K) for the five Idaho Power Co. dams is substantially lower than the total of $166,100,000 stated by the company in its application to the Federal Power Commission on December 15, 1950, for a license to build Oxbow Dam. Whichever figure is used, it cannot be properly applied to the prime capability of the five dams on an integrated basis because additional costs would be incurred at other plants in order to obtain the greater capability of the five plants based on integration. Such costs are not included in Mr. Houston's figures.

(3) Mr. Houston has made a further error in assuming an annual cost for the Idaho Power Co. dams of only 4.4 percent of the investment. The Government can develop power at a cost around this level because it pays about 2½ percent for money. But the Idaho Power Co. is allowed to make a return on its investment, and does obtain a rate of return of at least 6 percent. Correcting for this factor alone, the annual cost on the company's investment becomes at least 7.9 percent, exclusive of all taxes.

(4) It is evident from the errors made by Mr. Houston that the estimated cost of the incremental power of the Hells Canyon development over that of the Idaho Power Co. dams, based on his unverified assumptions related to the phase D level of development, is greatly exaggerated at $55.50 per kilowatt-year. Without attempting to determine the actual cost of this incremental power but to indicate the cost that Mr. Houston would have arrived at if he had made the computations correctly, we would arrive at $25.99 per kilowatt-year. The following discussion illustrates the correct procedure he should have followed in calculating the cost of incremental power. Since we have already pointed out that the 715,500 kilowatts attributed to Hells Canyon is a figure we cannot substantiate, the actual figures used below have no significance other than to illustrate the answers that Mr. Houston should have obtained. The cost of incremental power is properly determined from the difference in annual costs between that for the high-head dam at Hells Canyon and that for the five low-head dams of the company. On the basis of an investment in the company's plants of not less than $133,874,000 used by Mr. Houston and an annual cost of 7.9 percent, the annual cost of power produced by the five low-head dams would be $10,576,000. The

[1] The transcript shows a figure of 615,500 which we assume to be a typographical error for 715,500 whic appears at that point in the mimeographed copy of Mr. Houston's prepared statement.

annual cost of power from the high-head Hells Canyon Dam would be $14,696,000 on the basis of an investment of $334,000,000 and an annual cost of 4.4 percent on the investment. In both cases, only at-site costs are considered. The difference in annual costs of the two systems being compared is $4,120,000 and represents the annual cost of the difference in power output between the two plans, which Mr. Houston alleges to be 158,500 kilowatts. Thus it can properly be concluded that Mr. Houston's answer should have been $25.99 per kilowatt-year.

The proper determination of the incremental cost would be derived in a similar manner using the following figures. The prime power added to the system by Hells Canyon has been determined to be 1,124,000 kilowatts. The prime power added to the Idaho Power Co. system by the five run-of-river plants would only amount to about 390,000 kilowatts unless firmed up by purchase of steam-electric or hydro power from other systems where storage is available. Therefore, the incremental power from Hells Canyon in excess of the five plants would be not 158,500 but 734,000 kilowatts. The annual cost of the 1,124,000 kilowatts has been shown to be $17,552,000, which incidentally, is slightly more than the 4.4 percent of investment derived by Mr. Houston. This includes $3,222,000 for the annual cost of additional downstream generating facilities. This annual cost is $6,976,000 more than the annual cost of the five run-of-river plants, and would amount of $9.50 per kilowatt for the 734,000-kilowatt increment.

(5) Mr. Houston's analysis has been fundamentally wrong in assigning to Hells Canyon a smaller assumed power benefit related to the same D level of Columbia River development. The previous discussion has shown that the economic justification of the project today rests substantially upon the power contribution to the authorized C–2 system which would be 1,124,000 prime kilowatts. It should not be overlooked, also, that the Army engineers have testified that even in phase D plans including Hells Canyon Dam are preferable to other alternatives.

*(c) Will transmission costs be 1 mill or 2 mills per kilowatt-hour?*—Mr. Houston criticized the 1-mill cost estimate of Interior to deliver high-load factor power to the phosphate fields of southeastern Idaho by asserting that if the load factor drops to 50 percent, the transmission cost rises to 2 mills. Testimony before the committee by the representatives of the Pacific Supply Cooperative and the Central Farmers Fertilizer Co. has supported the position of the Department that a substantial high-load factor business will develop to produce phosphorus for fertilizer. On that basis, it will be a fact that such a load factor of 90 percent or better will be served at an approximate cost of 1 mill per kilowatt-hour. If however, another load were also served at a load factor of 50 percent, that load would pay a higher average price per kilowatt-hour. This would follow from the manner in which the Federal power rates are fixed, since they are based on a kilowatt-year charge. Hence the sale of low load factor power would produce higher revenues per kilowatt-hour which would more than offset additional transmission costs per kilowatt-hour. It is pointless to assert that a low load factor will involve a higher transmission cost than a high load factor, and to imply that the transmission of power will therefore be uneconomic.

*4. Kooskia Dam*

Mr. Houston urged the construction of Kooskia Dam on the Clearwater River instead of Hells Canyon Dam. He argued that Kooskia would give greater flood control than Hells Canyon, and provide more power in combination with the Idaho Power Company's five dams than would Hells Canyon.

This tactic can only be assumed to be diversionary since Kooskia is not an alternate for Hells Canyon but is a worthy project which should be considered in addition to Hells Canyon. However, until such time as the local opposition expressed in the Army hearing because of the flooding of three towns, a part of an Indian reservation, railroad and highway in the reservoir area is satisfied, the construction of the Kooskia Dam cannot be undertaken.

The Corps of Engineers has studied these projects in considerable detail and have concluded that they would be about equally effective in providing flood control in major floods such as occurred in 1894. Their more important conclusion was that in the ultimate control of floods, both projects should eventually be developed. The Corps of Engineers point of view in this regard is set forth in Colonel Itschner's letter of April 18, 1952, a copy of which is attached.

The argument that Kooskia combined with the five Idaho Power Co. dams would produce more power than Hells Canyon is completely beside the point and without merit. Furthermore, Mr. Houston's claims as to the amount of power that would be produced are grossly exaggerated and could not be checked.

It should be readily apparent that what he should have compared was development of the same reaches of the two rivers in each case, namely, Kooskia plus the five run-of-river plants with Kooskia plus Hells Canyon. He would find in such a comparison that the latter combination would add well over 400,000 kilowatts more prime power to the system than the former.

*5. Kooskia Dam avoids the question of water rights involved in Hells Canyon Dam*

Mr. Houston suggested, in proposing his combination of Kooskia and the Idaho Power Co. plants, that this would not be subject to the effect of upstream irrigation depletions as would Hells Canyon. It is true that Kooskia would not involve the question of water rights for irrigation since there is little possibility for such development in that basin. The Department's position is that there is no conflict whatever between water rights and Hells Canyon Dam. Full allowance is made for priority of use of the water for irrigation purposes. On the otherhand, Mr. Houston failed to state that the five run-of-river plants would be subject to the same water right problem and stream-flow depletion as would Hells Canyon. It is plain nonsense to say that Hells Canyon should not be built because of possible conflict with water rights, but that the Idaho Power Co. plants could be built without similar effects. The interrelationship of power and irrigation rights must be resolved and the streamflow depletion from upstream irrigation must be accepted in computing the economics of power production in either case. The final decision that should be made, therefore, is to adopt the plan for development of this section of the Snake River which will make the maximum use of the water resources for the benefit of the region and for the country as a whole.

Attachment: Letter of April 18, 1952, from Colonel Itschner, Division Engineer, Corps of Engineers, to Dr. Paul J. Raver.

CORPS OF ENGINEERS, UNITED STATES ARMY,
OFFICE OF THE DIVISION ENGINEER,
NORTH PACIFIC DIVISION,
*Portland 5, Oreg., April 18, 1952.*

Dr. PAUL J. RAVER,
*Administrator, Bonneville Power Administration,*
*Portland 8, Oreg.*

DEAR DR. RAVER: In reply to your letter of April 11, 1952 I am pleased to furnish the following comments in reply to statements of Mr. Holland Houston before the Subcommittee on Irrigation and Reclamation of the House Committee on Interior and Insular Affairs during the Hells Canyon hearings.

The statements of Mr. Gordon H. Fernald of this office, representing the Corps of Engineers, as to the flood-control and navigation benefits assigned to the Hells Canyon project by the Corps of Engineers, are already included in the record of the above hearing. Supplementing these studies, I refer to the extended details contained in our Review Report on the Columbia River and Tributaries which is now being printed as House Document No. 531, Eighty-first Congress, second session. In summary of this material, the Hells Canyon project was recommended for immediate construction as a part of the main control plan, which was conceived, analyzed in the report, and subsequently recommended for the purpose of controlling floods in the Columbia River Basin, particularly along the highly developed lower Columbia River. Of the 27,000,000 acre-feet of storage found necessary to provide reasonable control of the Columbia River floods, Hells Canyon would provide 3,280,000 acre-feet of usable storage, as conceived by the Corps of Engineers, or 3,880,000 acre-feet, as now recommended for authorization by the Bureau of Reclamation. The use of this storage as a part of the main control plan will provide complete control of the Snake River discharges at that point. The resulting capture of the total volume of flood flows from the upper Snake River at Hells Canyon for later release in the interest of power, navigation and other beneficial uses, will be of material benefit to the lower river areas and, as an integral part of the main control plan, is entitled to a share of the over-all flood control benefits accruing therefrom. Of the total average annual flood control benefits of $16,191,800 creditable to the main control plan, Hells Canyon has been allocated $1,459,800. Such was the conclusion of our review report studies and I find no reason to modify that finding at this time. In short, construction and operation of the Hells Canyon project as planned will result in material flood-control benefits to the lower river areas.

Navigation benefits were similarly analyzed in connection with our Columbia River Review Report and support for the total $189,000 annual navigation benefits was placed in the record of the hearing by Mr. Fernald. Although the amount of navigation that will develop in the future on the Hells Canyon pool is a matter

of conjecture at this time, I have every reason to believe that a traffic of considerable magnitude will be developed thereon. Release of water stored in the Hells Canyon reservoir to augment natural stream flows will undoubtedly be beneficial to downstream navigation, as it will to pollution control and other purposes affected by natural low water flows. These benefits to navigation, totaling an estimated $91,000 annually, are also believed reasonable and realistic.

This office has not definitely established that 5,000,000 acre-feet of usable storage could be feasibly and economically developed at the Kooskia site on Clearwater River, as suggested by Mr. Houston as a substitute for Hells Canyon. In connection with the studies for House Document 531, Eighty-first Congress, no development at this site was considered that would provide 5,000,000 acre-feet of usable storage. Since this project was considered in that report only as an alternate to the Glacier View project in the main control plan, it did not receive as thorough an analysis as did other projects which were recommended for early construction. Because of the strong opposition to it by local interests in 1948, the project was generally accepted as one for later development in the long-range plan. The project reported on in House Document 531 would provide usable storage of 3,100,000 acre-feet based on a reservoir draw-down of 35 percent out of a total capacity of 4,600,000 acre-feet. Although this office has not analyzed in detail a project with more usable storage than 3,100,000 acre-feet at Kooskia, there does remain a strong possibility that as much as 5,000,000 acre-feet of usable storage will prove feasible.

The possibility of substituting Kooskia for Hells Canyon in the Army main control plan can be answered categorically as follows. Since Hells Canyon is located on Snake River and Kooskia is located on Clearwater River, Kooskia could not be considered as a full substitute for Hells Canyon. It might be considered as an alternate for Hells Canyon in order to meet certain of the downstream flood control aims of the main control plan but it would not have the same reregulating effect that Hells Canyon would have on Snake River flows.

Flood-control benefits from regulation by Hells Canyon Reservoir during the 1894 flood with Hells Canyon considered to be part of the main control plan would be approximately the same as the benefits that could be attained with regulation by an alternate at Kooskia. The volume that would be stored in either reservoir is shown in the tabulation below, together with the reduction in peak discharge at the dam site. Benefits from regulation of the 1948 flood would be larger from the Kooskia project, but the main control plan with either project would provide for control of that flood to 700,000 cubic feet per second at The Dalles. With Kooskia as an alternate to Hells Canyon, no storage would be necessary in John Day Reservoir for this degree of control of the 1948 flood. The volumes stored and peak reduction for that flood are also shown below under main control plan operation.

| Reservoir | Volume stored during flood period at The Dalles | Observed inflow | Modified inflow | Regulated outflow | Reduction |
|---|---|---|---|---|---|
| | *Acre-feet* | *Cubic feet per second* | *Cubic feet per second* | *Cubic feet per second* | *Cubic feet per second* |
| 1894 flood: | | | | | |
| Hells Canyon | 2,600,000 | 130,000 | 59,000 | 0 | 59,000 |
| Kooskia | 2,800,000 | 93,000 | 93,000 | 0 | 93,000 |
| 1948 flood: | | | | | |
| Hells Canyon | 1,780,000 | 55,100 | 41,000 | 5,000 | 36,000 |
| Kooskia | 2,980,000 | 99,000 | 99,000 | 5,000 | 94,000 |

Although Kooskia would capture a slightly larger volume of flood flows, it does not have the reregulating possibilities of Hells Canyon, hence the amount of flood-control benefits creditable to Kooskia would be of about the same magnitude as those creditable to Hells Canyon.

Navigation benefits from a project at Hells Canyon would amount to $189,000 annually, while from a project at Kooskia they would amount to about $16,000. Navigation benefits on Hells Canyon pool and in the reach between Hells Canyon and Lewiston would not have similar counterparts in the Kooskia project.

I hope that the above information will serve your needs.

Sincerely yours,

E. C. ITSCHNER,
*Colonel, Corps of Engineers, Division Engineer.*

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